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For related information see also *Astronautics*.

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SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) **2320**

89 ASTRONOMY **2328**
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS **2331**
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION **2332**
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS **2335**
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION **2336**
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL **2336**

Note: N.A. means that no abstracts were assigned to this category for this issue.

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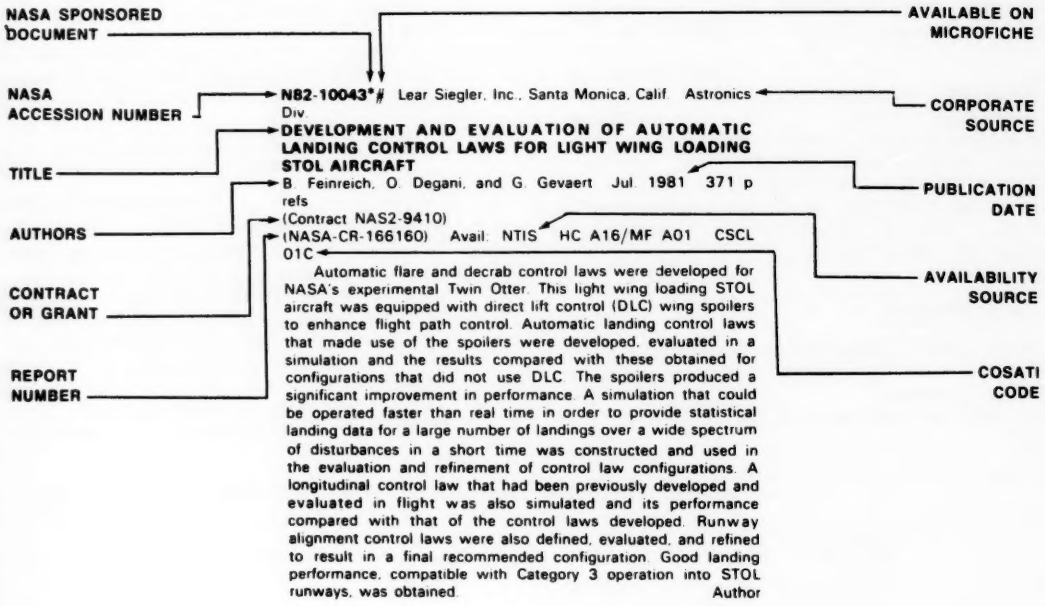
TYPICAL CITATION AND ABSTRACT


NASA SPONSORED DOCUMENT
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NASA ACCESSION NUMBER
N82-10043*# Lear Siegler, Inc., Santa Monica, Calif. Astronics Div.
CORPORATE SOURCE
TITLE
DEVELOPMENT AND EVALUATION OF AUTOMATIC LANDING CONTROL LAWS FOR LIGHT WING LOADING STOL AIRCRAFT
PUBLICATION DATE
AUTHORS
B. Feinreich, O. Degani, and G. Gevaert Jul. 1981 371 p refs
CONTRACT OR GRANT
(Contract NAS2-9410)
AVAILABILITY SOURCE
REPORT NUMBER
(NASA-CR-166160) Avail: NTIS HC A16/MF A01 CSCL 01C
COSATI CODE
Automatic flare and decrab control laws were developed for NASA's experimental Twin Otter. This light wing loading STOL aircraft was equipped with direct lift control (DLC) wing spoilers to enhance flight path control. Automatic landing control laws that made use of the spoilers were developed, evaluated in a simulation and the results compared with these obtained for configurations that did not use DLC. The spoilers produced a significant improvement in performance. A simulation that could be operated faster than real time in order to provide statistical landing data for a large number of landings over a wide spectrum of disturbances in a short time was constructed and used in the evaluation and refinement of control law configurations. A longitudinal control law that had been previously developed and evaluated in flight was also simulated and its performance compared with that of the control laws developed. Runway alignment control laws were also defined, evaluated, and refined to result in a final recommended configuration. Good landing performance, compatible with Category 3 operation into STOL runways, was obtained. Author

VOLUME 20 NUMBER 16 AUGUST 23, 1982

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N82-25170*# Grumman Aerospace Corp., Bethpage, N.Y.
STUDY OF VTOL IN GROUND-EFFECT FLOW FIELD INCLUDING TEMPERATURE EFFECT Final Report
W. G. Hill, R. C. Jenkins, S. G. Kalemaris, and M. J. Siclari Apr. 1982 179 p refs
(Contract NAS2-10645)
(NASA-CR-166258; NAS 1.26:166258) Avail: NTIS HC A09/MF A01 CSCL 01A

Detailed pressure, temperature, and velocity data were obtained for twin-fan configurations in-ground-effect and flow models to aid in predicting pressures and upwash forces on aircraft surfaces were developed. For the basic experiments, 49.5 mm-diameter jets were used, oriented normal to a simulated round plane, with pressurized, heated air providing a jet. The experimental data consisted of: (1) the effect of jet height and temperature on the ground, model, and upwash pressures, and temperatures, (2) the effect of simulated aircraft surfaces on the isolated flow field, (3) the jet-induced forces on a three-dimensional body with various strakes, (4) the effects of non-uniform coannular jets. For the uniform circular jets, temperature was varied from room temperature (24 C) to 232 C. Jet total pressure was varied between 9,300 Pascals and 31,500 Pascals. For the coannular jets, intended to represent turbofan engines, fan temperature was maintained at room temperature while core temperature was varied from room temperature to 437 C. Results are presented. B.W.

N82-25171# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugfuehrung.
PROCEEDINGS OF THE 11TH SYMPOSIUM ON AIRCRAFT INTEGRATED DATA SYSTEMS
Nov. 1981 454 p refs Symp. held at Cologne, 22-24 Sep. 1981
(DFVLR-Mitt-82-02) Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

The acquisition and processing of in-flight data are discussed. Flight recorder design and usefulness; cost benefits of improved data systems; trends in data system engineering are considered. Aircraft accident investigation and maintenance as well as engine monitoring are covered. For individual titles, see N82-25172 through N82-25189.

N82-25172# Sperry Univac, St. Paul, Minn.
SOLID-STATE FLIGHT INCIDENT RECORDER c06
D. Amundson *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 17-31 refs (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

A deployable flight incident recorder based on MNOS technology, suitable for fighter aircraft, is described. Capable of recording 30 min of digital and 15 min of audio information, the equipment weighs 3.5 lbs and dissipates 3.5 W. Flight and crash tests show that it is more reliable than tape recorders, and improves access times a million-fold. If audio is not required, engine monitoring, aircraft fatigue recording and program storage for onboard computers are possible. Author (ESA)

N82-25173# Hamilton Standard, Windsor Locks, Conn.
SOLID STATE CRASH SURVIVABLE FLIGHT DATA RECORDERS FOR MISHAP INVESTIGATION c35
H. R. Ask *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 33-68 refs (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

The state of the art in solid state memories, microprocessors and crash survival is reviewed. Flight recorders for small and large civil transport aircraft are described. Heat flow problems with crash survivable designs are solved, using an intumescent outer layer for the enclosure. This provides heat absorbtion during a phase change, followed by creation of a passive insulation layer formed by the charred residue. An aluminum alloy housing under the intumescent layer is the primary rigid structure for penetration, shock and static crush resistance. The small aircraft system has a 131 kbit memory, providing 30 min of prior flight data with > 100% reserve, using data compression. It protects airborne and on ground signal goodness data and is nondeployable. The large aircraft system stores the 21 min of raw input data and the last 15 hr of data in memory with data compression possible. It protects in memory two flight cycles of any duration, with total elapsed time > 25 hr possible. Author (ESA)

N82-25174# Sundstrand Data Control, Inc., Redmond, Wash.
NEW TECHNIQUES IN DATA RETRIEVAL AND DISPLAY c35
G. S. L. Benn *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 69-91 refs (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

The contribution of multicolor graphics to the display and interpretation of aircraft data from digital flight data recorders is described. Video graphic techniques for improving the speed of data interpretation and methods that allow rapid quick look selected data are compared with previous methods. For a noncrash incident, a two page printout of relevant parameters, photographs via the screen print of the last hour of flight together with zoomed detail of the incident, and a permanent record of flight data are available in < one hour. Quick look capability is ensured by electronic scrolling of graphed data coupled with direct conversion of digital data to engineering units. Author (ESA)

N82-25175# Eurocontrol Agency, Brussels (Belgium).
ON-LINE EXPERIMENTS IN ACQUIRING AND EXPLOITING AIDS DATA FOR ATC PURPOSES c04
M. E. Cox *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 93-114 refs (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

Problems in acquiring real time data from aircraft integrated data systems are discussed. The experimental evaluation of AIDS data applications and investigation of a functional system are

described. Flight tests indicate that the acquisition of aircraft data via a selectively addressed secondary surveillance radar mode S transponder is straightforward if an ARINC 429 Mk 33 digital information transfer system interface is available. Author (ESA)

N82-25176# Vereinigung Cockpit, Frankfurt am Main (West Germany).

A PILOT'S VIEW ON POSSIBLE USES OF AIDS **c04**

Christian Denke *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 125-130 (For primary document see N82-25171 16-01)

Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

Problems with the U.S. beacon collision avoidance system and the Eurocontrol - DFVLR airborne link terminal are highlighted. The U.S. system cannot handle a large number of aircraft, and resolves encounters through distance and flight level, with no reference to relative position. Avoidance maneuvers are only possible in the vertical plane. The avoidance maneuver logic has not been proven capable of accounting for individual aircraft performance. The European system substitutes visual messages for voice communication, increasing the already considerable visual workload. Its insistence on rigidly adhering to flight plans (as an aid to strategic ATC) increases fuel costs. Author (ESA)

N82-25177# Sundstrand Data Control, Inc., Redmond, Wash.

A NEW ALL-PURPOSE DIGITAL FLIGHT DATA RECORDER **c35**

P. H. Eason *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 131-158 ref (For primary document see N82-25171 16-01)

Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

A recorder which can be installed interchangably in ARINC 542 or ARINC 573/717 equipped aircraft features a coplanar, peripheral belt driven magnetic tape transport containing 450 ft of 1/4 in tape. Two interleaved 4-channel read/write heads and two erase heads are incorporated. A 7.5 deg external drive step motor operating in a slew mode drives the tape at 6 ips. The electronics cards are standard plug-in boards containing: read/write, transport, data acquisition data acquisition expansion, and aircraft wiring interfaces; as well as the recording system and data acquisition controllers. The built in test capability exceeds 95% fault detection. Author (ESA)

N82-25178# Air Navigation Services, Inc., Westerngrund (West Germany). Advisory Group.

AERONAUTICAL INFORMATION DATA SUBSYSTEMS **c82**

Frank W. Fischer *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 159-184 refs (For primary document see N82-25171 16-01)

Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

The case for reorganizing aeronautical information processing is argued. Air traffic controllers need access to correct, current, definitive data on activity in their area. Since they have to make real time decisions, systems must provide information in a rapidly assimilable and retransmissible form. A centralized data source is required to preprocess data. Author (ESA)

N82-25179# Dayton Univ., Ohio. Research Inst.

THE EFFECT OF VERY HEAVY RAIN UPON AIRCRAFT AND ITS ROLE IN WIND SHEAR ATTRIBUTED ACCIDENTS **c03**

P. A. Haines and J. K. Luers *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 185-215 refs (For primary document see N82-25171 16-01)

Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

Theoretical and experimental analyses of the effects of very heavy rain on aircraft performance are summarized. Analysis reveals momentum loss, increased drag, and reduced lift resulting from cratering of the rainwater film on airfoils by raindrops. Momentum penalties were derived from a combined drop trajectory/potential flow analysis. The derived penalties were introduced into a digital flight simulation program and the effect of very heavy rain was compared to that of wind shear by performing landings in combinations of wind, rain, no wind, and no rain. Results show that the derived wind shears of accident reconstructions are too large because a significant part of the loss in indicated airspeed is caused by rain. Author (ESA)

N82-25180# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Forschungszentrum.

THE DFVLR DIGITAL FLIGHT DATA READOUT AND PROCESSING STATION AND ITS UTILITY **c06**

H. Hardegen *In its* Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 217-245 (For primary document see N82-25171 16-01)

Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

Efforts to meet aviation authority requirements, scientific interest, and commercial requests at a flight data readout and processing station are described, with emphasis on bit rates, data fault correction, and reduction of data loss during transcription and reformatting. Regenerated data are recorded on computer tape and an eight-channel plot which provides a quick look the preceding flight history during regeneration is produced. All the computer programs are modular. After the program is started, the initital and final blocks are requested as the parameters to be calculated. Conversion from digital to engineering units is checked manually. Data losses are easily localized by counting the frames per minute and checking the synchronization words. Author (ESA)

N82-25181# Lufthansa German Airlines, Hamburg (West Germany).

SIDESLIP INDICATION SYSTEM AS A FUEL SAVING AID IN JET TRANSPORT AIRCRAFT OPERATION **c06**

Dieter Horst *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 247-275 (For primary document see N82-25171 16-01)

Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

The relationship between sideslip angle heading constant, and roll angle is outlined and a sideslip sensor is described. A conical pressure sensing probe extends through the fuselage perpendicular to the local air flow. Unequal pressure arising from sideslip causes two paddle blades to rotate the probe until pressure on each paddle is equal, i.e., until the probe is realigned with the airstream. During rotation, output elements attached to the probe are also rotated, providing electrical signals proportional to sideslip angle to an indicator. Tests on an A-300 Airbus show that avoiding sideslip cuts fuel consumption by 0.2%. Author (ESA)

N82-25182# Societe de Fabrication d'Instruments de Mesure SFIM, Massy (France).

AN INTERMEDIATE SOLUTION BETWEEN BASIC AND EXPANDED AIRCRAFT INTEGRATED DATA SYSTEMS (AIDS) **c35**

Claude Robert *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 277-300 refs (For primary document see N82-25171 16-01)

Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

A single digital flight data acquisition and management unit, divided for reliability into two parts, is proposed as an alternative to ARINC 717. One part deals with mandatory parameters which are sampled, coded, and transmitted in a PCM stream to the digital flight data recorder. The second part processes the parameters and is user programmable. Analysis consists of exceedance processing (e.g., engine, nacelle) gas pass analysis, AIDS monitoring and aircraft system warning from the flight warning computer. Airline response indicates that this system meets their requirements. Author (ESA)

N82-25183# Lockheed Aircraft Service, Inc., Ontario, Calif.

FLIGHT DATA RECOVERY UNDER ADVERSE CONDITIONS **c35**

E. J. Rosenbauer *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 301-322 ref (For primary document see N82-25171 16-01)

Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

Methods for overcoming data loss, including bit dump, bit shift, forward and reverse readout, time displacement compensation (TDC), wideband TDC, and supersynchronization are discussed. Supersynchronization systems recognize acquisition of any one sync word as an in-sync condition and process accordingly. They open a window prior to the end of the subframe which enables the circuit to look for the next sync work up to 8 bits early. A feedback loop enables one shot timing methods to track

the average bit rate automatically. A time duration equal to 70.7% of the average bit period is recommended. A digital bit averaging technique, in which the bit decision time is determined by the average of the two previous bits, gives excellent results. With forward and reverse processing, data are processed in the usual way through the engineering conversion process. Valid data, prior to the out of sync area, look normal. The computer then goes to the end of the subframe and processes data from this point backwards toward the sync loss area. Author (ESA)

N82-25184# United Technologies Corp., Windsor Locks, Conn.
GAS PATH ANALYSIS OF COMMERCIAL AIRCRAFT ENGINES **c07**
Louis A. Urban *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 323-357 (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122.90

A mathematical means of determining overall engine performance, individual module performance and sensor performance from any specified set of engine parameters is introduced. If Ze = HeXe, where Ze is a set of engine measurement deltas, X2 is a set of engine module deviations and He is a set of partial derivatives, interrelating the two sets, it follows that Xe can be solved for by taking the product of Ze times the inverse of He (the diagnostic matrix). A maximum likelihood estimation technique ensures that measurements are noise free. Operating mode can include in-flight or ground-based analysis. Airline experience shows that gas path analysis is cost effective and technically sound. Author (ESA)

N82-25185# Technische Universitaet, Brunswick (West Germany). Lehrstuhl fuer Flugmechanik.
GROUND SPEED MEASUREMENT FROM DME/VHF OMNIRANGE NAVIGATION (VOR) DATA **c04**
P. Voersmann *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 359-380 refs (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122.90

Off-line computer results of DME/VOR ground speed are compared with data from an airborne inertial navigation system platform. Signal properties of DME/VOR data are discussed, and requirements for filtering the data are stated. Best agreement between the two systems (within 2 knots) is achieved when the aircraft is flying on a constant radial, i.e., when the radial ground speed is negligibly small. Oscillation of the radial ground speed component around low frequencies is attributed to hardware limitations. Author (ESA)

N82-25186# British Aluminum Co., Ltd., London (England).
GATHERING AND ANALYSING DATA ON THE BRITISH AIRWAYS BOEING 757 AIRCRAFT **c35**
Peter Waller *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 381-393 (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122.90

The maintenance and operational benefits of a data system connected to 24 serial digital data paths between avionics units are described. The set up includes a quick access recorder with on onboard playback capability, using a printer-plotter on the flight deck. A single unit collects, processes and distributes parameters. Separate processors handle the mandatory and integrated data system operations. Any parameter can be displayed, call up being through a simple mnemonic. Routine evaluation programs monitor flight operations, propulsion units, autoland performance and integrity, fuel performance, and the autoflight system. Engineers can request a printout of the times at which defined points of the flight occured, and use these to define the time at which reported incidents happened. The relevant parameters for this, and adjacent times, are quickly available. Author (ESA)

N82-25187# Naval Air Test Center, Patuxent River, Md. Systems Engineering Test Directorate.
U.S. NAVY UNIVERSAL LOCATOR AIRBORNE INTEGRATED DATA SYSTEM (ULAIDS) **c06**
Daniel M. Watters *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 395-417 (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122.90

A prototype aircraft/engine multidata monitoring recording and display microcomputer system is described. The ULAIDS is a distributed system, consisting of five multiplex terminals. It is modular and can be adapted to all types of aircraft. The terminals communicate via a MIL-STD-1553A data bus. The output subsystems comprise a maintenance recorder, a flight incident recorder, and an aircrew CRT display. A minicomputer based ground terminal is used for recorder ground playback and detailed maintenance/crash diagnostics analysis. Author (ESA)

N82-25188# Leigh Instruments Ltd., Carleton Place (Ontario).
VALUE OF SURVIVABILITY AND RECOVERABILITY OF FLIGHT DATA RECORDERS **c35**
James W. Wells and W. Donald Wells *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 419-440 refs (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF ; DFVLR, Cologne DM 122.90

Alternative design approaches to provide survival recorded flight information offer different degrees of effectiveness. The method of protecting recorded information selected in a given application should be that which provides the most economically effective capability. The value of accident information is derived from its usefulness in accident prevention. Capability and design trades for survivability versus contributions to usefulness of information is considered in terms of economic measurement. A method is outlined for assessing recorder survivability and recoverability direct benefits, (reduced cost of investigating accident or criminal intent) and bottom line benefits (reduction of aircraft grounding expenses or reduction of fault correction cost by more reliable data inputs). A.R.H.

N82-25189# British Aluminum Co., Ltd., London (England).
ANALYSIS OF TRANSIENT DATA FROM AIRCRAFT GAS TURBINE ENGINES USING AIDS **c07**
E. R. White *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p441-453 (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122.90

Takeoff margin trending is used to illustrate engine monitoring, using in-flight data. For each takeoff, engine pressure ratio (EPR) data are collected at 80 knots, and the peak turbine temperature prior to liftoff is modified by an amount equal to any subsequent throttle movement. Total air temperature at 100 knots is converted to a static air temperature by subtracting an amount equivalent to the ram rise. Peak turbine temperature is corrected to ISA conditions, then for EPR, to a full rated takeoff level. This gives the turbine temperature that the engine would have produced at a full rated thrust under ISA conditions. The corrected temperature is subtracted from the red line limit, giving a margin which is plotted as a historical trend. These margins agree almost exactly with ground run data. Author (ESA)

N82-25190# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
QUARTERLY JOURNAL OF AERONAUTICS AND ASTRONAUTICS
Huang Mingke, Hou Tianxiang, Zhou Rongchun, Meng Dejun, Bei Xizeng, Yue Zhongdi, Wang Shoumei, Feng Zhongyue, Tang Diyi, Li Wenlan et al 15 Jan. 1982 175 p refs Transl. into ENGLISH of Acta Aeronaut. et Astronaut. Sinica (China), v. 1, no. 2, 1980 p 1-104
(AD-A110944; FTD-ID(RS)T-0723-81) Avail: NTIS HC A08/MF A01 CSCL 01/3

Several topics in aeronautics and astronautics, mostly concerning aeronautical engineering, are discussed. A second order three-level scene for time-dependent finite difference methods is given. An aeronautical structural analysis system for static analysis is presented. Superalloy microstructural stability, electromagnetic wave absorbers, and additives for reducing heat flow rates are discussed. R.J.F.

N82-25191# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AERONAUTICAL KNOWLEDGE (SELECTED ARTICLES)
Bin Jiang, Dennis Meredith, Hankang Li, Yilin Zhu, and Jiaqi Song 12 Jan. 1982 22 p Transl. into ENGLISH from Hangkong

Zhishi (China), no. 3, Mar. 1981 p 2-3, 12-14, 18-19
(AD-A110617; FTD-ID(RS)T-0889-81) Avail: NTIS HC A02/MF A01 CSCL 22/1

China's second experimental satellite is discussed. A fictional account of a space shuttle mission is presented. Early Soviet manned space flight activity is reviewed. N.W.

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N82-25192# Stellenbosch Univ. (South Africa). Dept. of Engineering.

PREDICTION OF WING SIDE-EDGE SUCTION FORCES AND MAXIMUM INVISCID LIFT Ph.D. Thesis

C. Redelinghuys Sep. 1981 244 p refs
Avail: NTIS HC A11/MF A01

The possibility of predicting the characteristics of low aspect-ratio wings theoretically is investigated. A literature survey on theoretical techniques for edge separated flows, vortex breakdown and maximum theoretical wing lift is presented. It is shown that prediction of the maximum theoretical lift by means of the suction analogy leads to results which differ from those obtained by means of previous techniques. Comparisons with experiment shows that low aspect ratio rectangular wings do achieve lift coefficients close to the theoretical maximum value. A new method, based on Lan's quasi-vortex-lattice method and the suction analogy, is developed for the prediction of the aerodynamics of unconventional planforms. Author

N82-25193*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

AN ANALYTICAL PROCEDURE FOR COMPUTING SMOOTH TRANSITIONS BETWEEN TWO SPECIFIED CROSS SECTIONS WITH APPLICATIONS TO BLENDED WING BODY CONFIGURATION

Raymond L. Barger May 1982 20 p refs
(NASA-TP-2012; L-15053; NAS 1.60:2012) Avail: NTIS HC A02/MF A01 CSCL 01A

An analytical procedure is described for designing smooth transition surfaces for blended wing-body configurations. Starting from two specified cross section shapes, the procedure generates a gradual transition from one cross section shape to the other as an analytic blend of the two shapes. The method utilizes a conformal mapping, with subsequent translation and scaling, to transform the specified and shapes to curves that can be combined more smoothly. A sample calculation is applied to a blended wing-body missile type configuration with a top mounted inlet. S.L.

N82-25194*# Boeing Commercial Airplane Co., Seattle, Wash.

A HARMONIC ANALYSIS METHOD FOR UNSTEADY TRANSONIC FLOW AND ITS APPLICATION TO THE FLUTTER OF AIRFOILS Final Report

F. Edward Ehlers and Warren H. Weatherill Washington NASA May 1982 151 p refs
(Contract NAS1-15957)
(NASA-CR-3537; NAS 1.26:3537; D6-49821) Avail: NTIS HC A08/MF A01 CSCL 01A

A finite difference method for solving the unsteady transonic flow about harmonically oscillating wings is investigated. The procedure is based on separating the velocity potential into steady and unsteady parts and linearizing the resulting unsteady differential equation for small disturbances. The differential equation for the unsteady velocity potential is linear with spatially varying coefficients and with the time variable eliminated by assuming harmonic motion. A study is presented of the shock motion associated with an oscillating airfoil and its representation by the harmonic procedure. The effects of the shock motion and the resulting pressure pulse are shown to be included in the harmonic pressure distributions and the corresponding generalized forces. Analytical and experimental pressure distributions for the NACA 64A010 airfoil are compared for Mach numbers of 0.75, 0.80 and 0.842. A typical section, two-degree-of-freedom flutter analysis of a NACA 64A010 airfoil is performed. The results show a sharp transonic bucket in one case and abrupt changes in instability modes. Author

N82-25195# Weapons Systems Research Lab., Adelaide (Australia).

FLIGHT TESTS OF VARIOUS MK82 BOMB CONFIGURATIONS

R. E. Dudley and R. L. Pope Jan. 1982 27 p refs
(WSRL-0254-TR; AR-002-810) Avail: NTIS HC A03/MF A01

A series of fifteen 1/2 scale models of the MK82 bomb was fired from a gas gun with a nominal muzzle velocity of 120 m/s. The object of the trials was to compare the performance of various configurations, including streamlined models, models with lugs and fuses and some models with a modified tail cone. Three of the vehicles tested were the standard streamlined wind tunnel shape and the results from these are used as a benchmark in assessing the performance of the other configurations. Some of the trials were only partially successful and no data at all was obtained from two of the trials. However, all available results are presented and an assessment made of the relative performance of each configuration. Some comparisons are also made with wind tunnel measurements. The most striking aspect of the results is the 100% increase in drag resulting from the addition of lugs and fuses. R.J.F.

N82-25196*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

WIND-TUNNEL/FLIGHT CORRELATION, 1981

L. Wayne McKinney, ed. and Donald D. Baals, ed. Jun. 1982 224 p refs Workshop held at Hampton, Va., 19-20 Nov. 1981
(NASA-CP-2225; L-15368; NAS 1.55:2225) Avail: NTIS HC A10/MF A01 CSCL 14B

Wind-tunnel/flight correlation activities are reviewed to assure maximum effectiveness of the early experimental programs of the National Transonic Facility (NTF). Topics included a status report of the NTF, the role of tunnel-to-tunnel correlation, a review of past flight correlation research and the resulting data base, the correlation potential of future flight vehicles, and an assessment of the role of computational fluid dynamics. For individual titles, see N82-25197 through N82-25212.

N82-25197*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

STATUS OF THE NATIONAL TRANSONIC FACILITY c09

Robert L. Swain *In its* Wind-Tunnel/Flight Correlation, 1981 Jun. 1982 p 1-21 (For primary document see N82-25196 16-02)
Avail: NTIS HC A10/MF A01 CSCL 14B

Construction status of major tunnel systems/subsystems of the National Transonic Facility, an advanced high Reynolds number capability wind tunnel utilizing cryogenic nitrogen as the fluid medium is presented. N.W.

N82-25198*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

REVIEW OF THE 1980 WIND-TUNNEL/FLIGHT CORRELATION PANEL

Theodore G. Ayers *In* NASA. Langley Research Center Wind-Tunnel/Flight Correlation, 1981 Jun. 1982 p 23-32 refs (For primary document see N82-25196 16-02)
Avail: NTIS HC A10/MF A01 CSCL 01A

Wind tunnel/flight correlation history from the P-51 to the F-8 supercritical wing is reviewed, showing that researchers continue to be faced with nearly identical discrepancies in predicted versus measured drag. The capabilities of the National Transonic Facility to allow assessment of the effects which have heretofore plagued researchers and aircraft designers are anticipated. N.W.

N82-25199*# Lockheed-Georgia Co., Marietta.

WIND-TUNNEL/FLIGHT-DRAG CORRELATION

John H. Peterson *In* NASA. Langley Research Center Wind-Tunnel/Flight Correlation, 1981 Jun. 1982 p 33-46 refs

(For primary document see N82-25196 16-02)
Avail: NTIS HC A10/MF A01 CSCL 01A

Predicted and flight-test drag on the C-5A and the C-141 are correlated. Equivalent rigid flight-test profile drag and a rigid estimate based on wind tunnel data are also correlated. Correlations for the National Transonic Facility are included. N.W.

N82-25200*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TUNNEL-TO-TUNNEL CORRELATION
Frank W. Steinle, Jr. *In* NASA. Langley Research Center Wind-Tunnel/Flight Correlation, 1981 Jun. 1982 p 47-63 refs (For primary document see N82-25196 16-02)
Avail: NTIS HC A10/MF A01 CSCL 01A

Flow quality is discussed. Incremental comparisons of: (1) the angle of attack, (2) the axial force coefficient, and (3) the base cavity axial force coefficient against the normal force coefficient are presented. Relative blockage determination, relative buoyancy corrections, and boundary layer transition length are discussed. Blockage buoyancy caused by tunnel model wall dynamic interaction is discussed in terms of adaptive walls. The effect of 'transonic turbulence factor' is considered. N.W.

N82-25201*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
WIND-TUNNEL/FLIGHT CORRELATION PROGRAM ON XB-70-1
John B. Peterson, Jr. *In its* Wind-Tunnel/Flight Correlation, 1981 Jun. 1982 p 65-91 refs (For primary document see N82-25196 16-02)
Avail: NTIS HC A10/MF A01 CSCL 01A

The XB-70-1 was selected for a wind-tunnel/flight correlation program as representative of a large, flexible supersonic airplane similar to a supersonic transport. Tests were made to determine the effects of control deflections, wing tip deflection, and variations in inlet mass flow (additive drag). N.W.

N82-25202*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PROBLEMS IN CORRELATION CAUSED BY PROPULSION SYSTEMS
Ronald H. Smith *In its* Wind-Tunnel/Flight Correlation, 1981 Jun. 1982 p 93-108 ref (For primary document see N82-25196 16-02)
Avail: NTIS HC A10/MF A01 CSCL 01A

Correlation efforts and selected results for transonic drag are reviewed. A process to reduce the typical error sources to decrease the errors inherent in the transonic aircraft development process is summarized. Author

N82-25203*# McDonnell Aircraft Co., St. Louis, Mo.
F-15 WIND-TUNNEL/FLIGHT CORRELATIONS
Larry G. Niedling *In* NASA. Langley Research Center Wind-Tunnel/Flight Correlation, 1981 Jun. 1982 p 109-115 refs (For primary document see N82-25196 16-02)
Avail: NTIS HC A10/MF A01 CSCL 01A

F-15 correlation data for longitudinal control and inlet-ramp effectiveness, and horizontal-tail setting for trim are presented. The Reynolds number effect on airfoil laminar bubble burst is included. N.W.

N82-25204*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AERODYNAMIC COMPARISONS OF STS-1 SPACE SHUTTLE ENTRY VEHICLE
James C. Young *In* NASA. Langley Research Center Wind-Tunnel/Flight Correlation, 1981 Jun. 1982 p 117-131 (For primary document see N82-25196 16-02)
Avail: NTIS HC A10/MF A01 CSCL 01A

A conventional flight-test program, which slowly and cautiously approaches more severe flight conditions, was not possible with the Orbiter. On the first flight, the Orbiter entered the atmosphere at Mach 28 and decelerated through the Mach range. (The subsonic portion of flight was also flown by another orbiter vehicle during the Approach and Landing Test Program.) Certification for the first flight was achieved by an extensive wind-tunnel test and analysis program and by restricting the flight maneuvers severely. The initial flights of the orbiter were heavily instrumented for the purpose of obtaining accurate aerodynamic data. Even without maneuvers to excite the system, the first flight provided comparisons between flight and wind-tunnel-derived predicted data in the areas of aerodynamic performance, longitudinal trim, and reaction-control jet interaction. The aerodynamic performance comparisons are presented. T.M.

N82-25205*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AERODYNAMIC COMPARISONS OF SPACE SHUTTLE ASCENT: STS-1 FLIGHT VERSUS WIND-TUNNEL PREDICTIONS
Rodney O. Wallace *In* NASA. Langley Research Center Wind-Tunnel/Flight Correlation, 1981 Jun. 1982 p 133-140 (For primary document see N82-25196 16-02)
Avail: NTIS HC A10/MF A01 CSCL 01A

It is found from the comparisons that large longitudinal aerodynamic differences exist between wind tunnel predictions and flight measurements. Cold gas plume simulation underpredicted Shuttle base pressure. It is concluded that observed flight prediction increments are probably caused by several factors such as input error, independent variable errors, plume effects, and Reynolds number effects. T.M.

N82-25206*# Boeing Commercial Airplane Co., Seattle, Wash.
OPPORTUNITIES FOR WIND-TUNNEL/FLIGHT CORRELATION WITH NEW BOEING AIRPLANES
Adelbert L. Nagel *In* NASA. Langley Research Center Wind-Tunnel-Flight Correlation, 1981 Jun. 1982 p 141-157 (For primary document see N82-25196 16-02)
Avail: NTIS HC A10/MF A01 CSCL 01A

The use of correlated data in airplane development is discussed. Areas of interest include initial airworthiness of an aircraft, low-speed configuration optimization, and high-speed configuration optimization. Data from wind tunnel tests are shown to be significant when applied to guarantee compliance, which includes fuel consumption, airspeeds, and takeoff and landing performance. The use of correlation in achieving FAA certification is also discussed. T.M.

N82-25207*# General Dynamics/Fort Worth, Tex.
F-16E PROGRAM OVERVIEW AND WIND TUNNEL/FLIGHT CORRELATION
A. P. Madsen *In* NASA. Langley Research Center Wind-Tunnel/Flight Correlation, 1981 Jun. 1982 p 159-172 ref (For primary document see N82-25196 16-02)
Avail: NTIS HC A10/MF A01 CSCL 01A

Correlation is defined in three different ways: comparisons of wind tunnel and/or theory with flight results; detailed studies of total vehicle drag from wind tunnel and flight tests; and attempts to understand the fundamental mechanisms of fluid flows associated with aircraft components in specific areas of the flight environment. The F-16E configuration is an outgrowth of studies conducted to produce a refined fighter wing design. Several iterations required to arrive at the combination of wing planform, camber, and twist which gives near optimum lift, drag, and high-angle-of-attack stability. Theoretical analyses were backed up by extensive experimental data to validate the design and are presented T.M.

N82-25208*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPACE-VEHICLE CORRELATION OF GROUND AND FLIGHT EXPERIMENTS
William I. Scallion *In its* Wind-Tunnel/Flight Correlation, 1981 Jun. 1982 p 173-176 (For primary document see N82-25196 16-02)
Avail: NTIS HC A10/MF A01 CSCL 01A

A 2-percent-scale model was designed for testing in the NTF. This model has remotely controlled elevons, body flap, and rudder to minimize tunnel entries associated with configuration changes in the NTF. The Shuttle Orbiter has a very large aerodynamic data base obtained in ground facilities. Since the vehicle flight-test program has already begun, a large amount of flight data can be analyzed and correlated with the NTF results. T.M.

N82-25209*# Grumman Aerospace Corp., Bethpage, N.Y.
X-29A FORWARD-SWEPT-WING DEMONSTRATOR AIRPLANE
Douglas R. Frei *In* NASA. Langley Research Center Wind-Tunnel/Flight Correlation, 1981 Jun. 1982 p 177-189 (For primary document see N82-25196 16-02)
Avail: NTIS HC A10/MF A01 CSCL 01A

The X-29A is a technology demonstrator. The FSW is just one of the technologies. Others include the following: discrete variable camber, relaxed static stability, triplex digital fly-by-wire (FBW) control system, variable-incidence/close-coupled canard, aeroelastically tailored composite wing, and thin supercritical airfoil. The growth potential for additional technologies is shown. T.M.

N82-25210*# Grumman Aerospace Corp., Bethpage, N.Y.
X-29A FOR NTF WIND-TUNNEL/FLIGHT CORRELATIONS
Gianky DaForno *In* NASA. Langley Research Center Wind-Tunnel/Flight Correlation, 1981 Jun. 1982 p 191-197 (For primary document see N82-25196 16-02)
Avail: NTIS HC A10/MF A01 CSCL 01A

Considerations and recommendations for correlation are given. Basic tunnel calibration prior to research and development tests is suggested. Areas of concentration include: wing cruise drag and drag rise, wing separation and stall, afterbody and base drag, propulsion effects, vortex flows, cavity flows, and excrescences. T.M.

N82-25211*# Massachusetts Inst. of Tech., Cambridge.
APPLICATION OF COMPUTATIONAL FLUID DYNAMICS (CFD) IN TRANSONIC WIND-TUNNEL/FLIGHT-TEST CORRELATION
Earl M. Murman *In* NASA. Langley Research Center Wind-Tunnel/Flight Correlation, 1981 Jun. 1982 p 199-215 refs (For primary document see N82-25196 16-02)
Avail: NTIS HC A10/MF A01 CSCL 01A

The capability for calculating transonic flows for realistic configurations and conditions is discussed. Various phenomena which were modeled are shown to have the same order of magnitude on the influence of predicted results. It is concluded that CFD can make the following contributions to the task of correlating wind tunnel and flight test data: some effects of geometry differences and aeroelastic distortion can be predicted; tunnel wall effects can be assessed and corrected for; and the effects of model support systems and free stream nonuniformities can be modeled. T.M.

N82-25212*# Boeing Military Airplane Development, Seattle, Wash.
SOME IDEAS AND OPPORTUNITIES CONCERNING THREE-DIMENSIONAL WIND-TUNNEL WALL CORRECTIONS
Paul E. Rubbert *In* NASA. Langley Research Center Wind-Tunnel/Flight Correlation, 1981 Jun. 1982 p 217-229 (For primary document see N82-25196 16-02)
Avail: NTIS HC A10/MF A01 CSCL 01A

Opportunities for improving the accuracy and reliability of wall corrections in conventional ventilated test sections are presented. The approach encompasses state-of-the-art technology in transonic computational methods combined with the measurement of tunnel-wall pressures. The objective is to arrive at correction procedures of known, verifiable accuracy that are practical within a production testing environment. It is concluded that: accurate and reliable correction procedures can be developed for cruise-type aerodynamic testing for any wall configuration; passive walls can be optimized for minimal interference for cruise-type aerodynamic testing (tailored slots, variable open area ratio, etc.); monitoring and assessment of noncorrectable interference (buoyancy and curvature in a transonic stream) can be an integral part of a correction procedure; and reasonably good correction procedures can probably be developd for complex flows involving extensive separation and other unpredictable phenomena. T.M.

N82-25213*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SOME ASPECTS OF CALCULATING FLOWS ABOUT THREE-DIMENSIONAL SUBSONIC INLETS
H. C. Kao 1981 19 p refs Presented at the 17th Joint Propulsion Conf., Colorado Springs, Colo., 27-29 Jul. 1981
(NASA-TM-82789; E-941; NAS 1.15:82789) Avail: NTIS HC A02/MF A01 CSCL 01A

Various three dimensional inlet models were calculated based on the potential flow model. Results are presented in the forms of surface static pressure, flow angularity, surface flow pattern, and inlet flow field. It is indicated that the extension of the lower lip can reduce the adverse pressure gradient and increase the flow separation bound. E.A.K.

N82-25214*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ELASTIC DEFORMATION EFFECTS ON AERODYNAMIC CHARACTERISTICS FOR A HIGH-ASPECT-RATIO SUPERCRITICAL-WING MODEL
Judith J. Watson May 1982 26 p refs
(NASA-TM-83286; L-15098; NAS 1.15:83286) Avail: NTIS HC A03/MF A01 CSCL 01A

The results of an investigation of the deformations of a high-aspect-ratio, force/pressure, supercritical-wing model during wind tunnel tests and the effects these deformations have on the wing aerodynamics are presented. A finite element model of the wing was developed, and then, for conditions corresponding to wind tunnel test points, experimental aerodynamic loads and theoretical aerodynamic loads were applied to the finite element model. Comparisons were made between the results of these load conditions for changes in structural deflections and for changes in aerodynamic characteristics. The results show that the deformations are quite small and that the pressure data are not significantly affected by model deformation. B.W.

N82-25215*# Northrop Corp., Hawthorne, Calif. Aircraft Div.
WATER TUNNEL FLOW VISUALIZATION AND WIND TUNNEL DATA ANALYSIS OF THE F/A-18
Gary E. Erickson May 1982 268 p refs Original contains color illustrations 2 Vol.
(Contract NAS1-16617)
(NASA-CR-165859; NAS 1.26:165859) Avail: NTIS HC A12/MF A01 CSCL 01A

Six degree of freedom studies were utilized to extract a band of yawing and rolling moment coefficients from the F/A-18 aircraft flight records. These were compared with 0.06 scale model data obtained in a 16T wind tunnel facility. The results, indicate the flight test yawing moment data exhibit an improvement over the wind tunnel data to near neutral stability and a significant reduction in lateral stability (again to anear neutral level). These data are consistent with the flight test results since the motion was characterized by a relatively slo departure. Flight tests repeated the slow yaw departure at M 0.3. Only 0.16 scale model wind tunnel data showed levels of lateral stability similar to the flight test results. Accordingly, geometric modifications were investigated on the 0.16 scale model in the 30x60 foot wind tunnel to improve high angle of attack lateral stability. S.L.

N82-25216*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SUBSONIC AERODYNAMIC AND FLUTTER CHARACTERISTICS OF SEVERAL WINGS CALCULATED BY THE SOUSSA P1.1 PANEL METHOD
E. Carson Yates, Jr., Herbert J. Cunningham, Robert N. Desmarais, Walter A. Silva, and Bohdan Drobenko May 1982 21 p refs Presented at the AIAA/ASME/ASCE/AHS 23rd Structures, Structural Dynamics and Materials Conf., New Orleans, 10-12 May 1982
(NASA-TM-84485; NAS 1.15:84485) Avail: NTIS HC A02/MF A01 CSCL 01A

The SOUSSA (steady, oscillatory, and unsteady subsonic and supersonic aerodynamics) program is the computational implementation of a general potential flow analysis (by the Green's function method) that can generate pressure distributions on complete aircraft having arbitrary shapes, motions and deformations. Some applications of the initial release version of this program to several wings in steady and oscillatory motion, including flutter are presented. The results are validated by comparisons with other calculations and experiments. Experiences in using the program as well as some recent improvements are described. S.L.

N82-25217*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXPERIMENTAL DETERMINATION OF FLOW-INTERFERENCE EFFECTS OF WING-MOUNTED, TWO-DIMENSIONAL, FULL-CAPTURE PROPULSION NACELLES IN CLOSE PROXIMITY TO A VEHICLE BODY AT A MACH NUMBER OF 6
Walter A. Vahl May 1982 36 p refs
(NASA-TM-83287; L-15209; NAS 1.15:83287) Avail: NTIS HC A03/MF A01 CSCL 01A

Experimental tests have been conducted to determine possible aerodynamic interference effects due to the lateral positioning of two dimensional propulsion nacelles mounted on a wing surface in close proximity to a vehicle body. The tests were conducted at a Mach number of 6 and a Reynolds number 7 million per foot. The angle of attack range for force tests was -9 deg to 9 deg. The model configurations consisted of combinations of rectangular and trapezoidal cross section bodies with a wing swept 65 and a rectangular planform wing. A pair of two dimensional, flow through propulsion nacelles simulated full capture inlet operation. S.L.

N82-25218*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THRUST-INDUCED EFFECTS ON LOW-SPEED AERODYNAMICS OF FIGHTER AIRCRAFT
Daniel W. Banks, P. Frank Quinto, and John W. Paulson, Jr. May 1982 25 p refs
(NASA-TM-83277; NAS 1.15:83277) Avail: NTIS HC A02/MF A01 CSCL 01A

Results of NASA Langley has conducted wind-tunnel investigations of several fighter configurations conducted to determine the effects of both thrust vectoring and spanwise blowing are reviewed. A recent joint NASA/Grumman Aerospace Corporation/U.S. Air Force Wright Aeronautical Laboratory wind-tunnel investigation was conducted to examine the effects of spanwise blowing on the trailing-edge flap system. This application contrasts with the more familiar method of spanwise blowing near the wing leading edge. Another joint program among NASA/McDonnell Aircraft Company/U.S. Air Force Wright Aeronautical Laboratory investigated the effects of reverse thrust on the low-speed aerodynamics of an F-15 configuration. The F-15 model was fitted with a rotating van thrust reverser concept which could simulate both in-flight reversing for approach and landing or full reversing for ground roll reduction. The significant results of these two joint programs are reported. A.R.H.

N82-25219*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PRODUCTION VERSION OF THE EXTENDED NASA-LANGLEY VORTEX LATTICE FORTRAN COMPUTER PROGRAM. VOLUME 1: USER'S GUIDE
John E. Lamar and Henry E. Herbert Apr. 1982 176 p refs
(NASA-TM-83303; NAS 1.15:83303) Avail: NTIS HC A08/MF A01 CSCL 01A

The latest production version, MARK IV, of the NASA-Langley vortex lattice computer program is summarized. All viable subcritical aerodynamic features of previous versions were retained. This version extends the previously documented program capabilities to four planforms, 400 panels, and enables the user to obtain vortex-flow aerodynamics on cambered planforms, flowfield properties off the configuration in attached flow, and planform longitudinal load distributions. Author

N82-25220# Wisconsin Univ. - Madison. Mathematics Research Center.
NONLINEAR TWO-DIMENSIONAL SAIL THEORY
Jean-Marc Vanden-Broeck Oct. 1981 20 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-79-27062)
(AD-A110450; MRC-TSR-2293) Avail: NTIS HC A02/MF A01 CSCL 01/3

Steady two-dimensional flow past a sail is considered. The sail is assumed to be supported by two masts. The flow and the shape of the sail are determined as functions of the direction alpha of the flow at infinity and the Weber number lambda. The full nonlinear problem is formulated as an integro-differential equation for the shape of the sail. This equation is discretized and solved numerically by Newton's method. Sail profiles, the slack in the sail, and the lift coefficient are presented for various values of alpha and lambda. GRA

N82-25221# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
ON THE AERODYNAMICS OF WINDBLAST Final Technical Report
Daniel J. Schneck 13 Nov. 1981 51 p refs
(Grant AF-AFOSR-3706-78)
(AD-A110495; VPI-E-81-31; AFOSR-82-0031TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

In two previous reports (Schneck, 1976, 1979) a mathematical theory was developed in order to calculate the aerodynamic loading to which a pilot is exposed during high speed ejections. Neglecting the effects of flow separation, preliminary results suggested that the pilot's musculo-skeletal resistance is not likely to withstand the tendency for dislodgement from a restraining surface if he is ejecting at Mach numbers exceeding 0.72. Recently (Schneck, 1979) the mathematical theory of windblast was modified to include some effects of flow separation. In the report that follows, these effects are examined in greater detail, particularly as they affect the time-course of limb dislodging forces after the onset of windblast. GRA

N82-25222# Scientific Research Associates, Inc., Glastonbury, Conn.
A NAVIER-STOKES SOLUTION FOR TRANSONIC FLOW THROUGH A CASCADE Final Report
S. J. Shamroth, H. McDonald, and W. R. Briley Jan. 1982 71 p refs
(Contract N00019-79-C-0558)
(AD-A111540; R81-920007-F) Avail: NTIS HC A04/MF A01 CSCL 20/4

Viscous transonic cascade problems are posed and answered by considering simple flow situations. These questions focus upon spatial differencing, specification of boundary conditions and use of artificial dissipation in flows containing shock waves. In regard to the first of these problems, the model problem clearly shows that converged solutions can be obtained using spatial central difference representations in both subsonic and supersonic portions of the flow. Boundary conditions in a simple one dimensional problem indicates that for flows having subsonic inflow and outflow conditions, specifications of total pressure on the upstream boundary and static pressure on the downstream boundary is satisfactory and physically realistic. Finally, various methods of calculating flows with shock waves were considered by solving a one dimensional flow problem with heat sources. Among the methods considered for obtaining stable solutions in the presence of shocks were second order dissipation methods, fourth order dissipation methods and pressure damping methods. GRA

N82-25223# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
EXPERIMENTAL ANALYSIS OF THE EFFECTS OF SWEEP AND ASPECT RATIO ON INCOMPRESSIBLE FLOW ABOUT FORWARD SWEPT WINGS M.S. Thesis
Paul W. Savage Dec. 1981 142 p refs
(AD-A111128; AFIT/GAE/AA/81D-26) Avail: NTIS HC A07/MF A01 CSCL 01/3

Low speed wind tunnel tests were conducted on nine wing planforms to determine the effect of sweep and aspect ratio on forward swept wings in incompressible flow. Sweep angles tested were -15, -30 and -45 degrees. Aspect ratios ranged from 2.05 to 4.79. A NACA 0006 airfoil section perpendicular to the leading edge was used for all models. Results showed increasing negative sweep decreased lift curve slope and shifted the aerodynamic center rearward. Increasing aspect ratio increased lift curve slope, decreased drag coefficient and shifted the aerodynamic center rearward. The wind tunnel aerodynamic data were compared to the Air Force Flight Dynamics Laboratory's Large Aircraft Performance Prediction Program to determine the program's ability to predict forward swept wing aerodynamic coefficients. At incompressible Mach numbers, the program was found to be accurate in predicting lift curve slope in the linear range using a positive sweep input. Drag Polar slope and moment coefficient were accurately predicted for lift coefficients below 0.4 using a negative sweep angle input. Neither positive

nor negative angle input predicted maximum lift coefficient accurately. Author (GRA)

N82-25224# Lockheed Missiles and Space Co., Huntsville, Ala.
SUBMISSILE AERODYNAMICS DURING DISPENSING
Thomas E. Lundy, William F. Bradcock, and Lajpat R. Utreja May 1981 23 p
(AD-A111778) Avail: NTIS HC A02/MF A01 CSCL 19/4

The aerodynamic interference effects of a submissile in the presence of a dispenser missile are determined. The analytical predictions are made using NEAR codes modified for applications to missile systems. A wind tunnel test was conducted to measure the static aerodynamic coefficients of a submissile in the flow field of a dispenser missile at Mach numbers 0.8 and 1.2. The parameters observed to have the greatest effect on the interference aerodynamics are the addition of fins on the submissile, the removal of the dispenser bay covers, the dispenser angle of attack and the submissile pitch angle. S.L.

N82-25225# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
INVESTIGATION OF UPWIND SCHEMES FOR FINITE ELEMENT ANALYSIS OF TRANSONIC FLOW OVER THIN AIRFOILS M.S. Thesis
Dennis L. Hunt Dec. 1981 93 p refs
(AD-A111168; AFIT/GAE/AA/81D-15) Avail: NTIS HC A05/MF A01 CSCL 20/4

Two finite element upwind techniques were investigated to see if convergent solutions could be obtained from the transonic potential equation for steady flow over thin airfoils. The first technique involves the use of parabolic upwind functions, that when added to the shape functions weight the upstream node in the supersonic region more than the downwind nodes. The second technique integrates the finite element equations over the area that influences the solution (i.e., the area inside a mach cone). Author (GRA)

N82-25226# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
STARTING TRANSIENTS IN SUPERSONIC NOZZLES AND NOZZLE-DIFFUSER ASSEMBLIES M.S. Thesis
Thomas Gregory Gates Dec. 1981 47 p refs
(AD-A111143; AFIT/GA/AA/81D-6) Avail: NTIS HC A03/MF A01 CSCL 20/4

In this investigation, the flow processes involved in shock induced starting of nozzles and diffusers similar to those used in gasdynamic lasers were studied. Two geometrically similar nozzles were used. The throat opening in the large single nozzle was 0.276 inches. The other was an array of nine nozzle passages in which the throat opening was 0.069 inches. Downstream of the nine nozzles were nine diffusers whose minimum opening was 0.286 inches. These 2-dimensional nozzles and diffusers were 0.75 inches thick. A full, started condition of uniform supersonic flow was achieved throughout the entire test area for both test sections. The processes leading to this condition were highly dynamic and complicated. It was found that successful starting depended not only on the initial diaphragm pressure ratio, but also the downstream test cell configuration. Starting the large single nozzle was enhanced by an increase of flow channel just downstream from the nozzle. This decreased the strength of the incident shock wave and there by increased the pressure ratio applied across the nozzle. As a result, the gasdynamic starting shock could pass on out of the nozzle at lower shock tube diaphragm pressure ratios than would have been the case if the area had remained constant in the flow channel behind the nozzle. GRA

N82-25227# Applied Analysis, Inc., Ann Arbor, Mich.
UNSTEADY TRANSONIC FLOWS IN TWO-DIMENSIONAL CHANNELS WITH OSCILLATING BOUNDARIES Final Technical Report, 2 Oct. 1980 - 1 Oct. 1981
T. C. Adamson, Jr. and A. F. Messiter Oct. 1981 103 p refs (Contract N00019-80-C-0587)
(AD-A111541; AAI-0587-FT) Avail: NTIS HC A06/MF A01 CSCL 20/4

Unsteady transonic flow in two-dimensional duct with a shock wave is considered. The flow entering the duct is uniform and steady; unsteadiness is caused by any mixture of impressed oscillations in wall shape and back pressure. Asymptotic methods are employed to give solutions for flow properties and for position and velocity of the shock wave in several different problems, characterized by the relative orders of the nondimensional amplitude and frequency of the oscillations. Illustrative example flows are considered, with a numerical solutions used for complex wall shapes. Author (GRA)

N82-25228*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
BOUNDARY-LAYER TRANSITION CORRELATION ON A SLENDER CONE IN WIND TUNNELS AND FLIGHT FOR INDICATIONS OF FLOW QUALITY Final Report, Jan. 1970 - Nov. 1978
N. Sam Dougherty, Jr. (ARO, Inc., Tullahoma, Tenn.) and David F. Fisher Arnold AFB, Tenn. AEDC Feb. 1982 49 p refs
(NASA-TM-84732; NAS 1.15:84732; AD-A111328; AEDC-TR-81-26) Avail: NTIS HC A03/MF A01 CSCL 20D

Boundary layer transition location measurements were made on a 10 deg sharp cone in 23 wind tunnels in the United States and Europe and in flight. The data were acquired at subsonic, transonic, and supersonic Mach numbers over a range of unit Reynolds numbers in an effort to obtain an improved understanding of the effect of wind tunnel flow quality on transition location. The data indicate that the transition mechanism in both wind tunnels in flight is associated with the formation of Tollmien-Schlichting waves in the laminar boundary layer. However, the location of the end of transition was found to be primarily a function of the noise under the laminar boundary of the cone surface and, within + or - 20 percent, independent of Mach number and unit Reynolds number. Author

N82-25229# Air Force Armament Lab., Eglin AFB, Fla.
DYNAMICS OF SUBSONIC TRACER PROJECTILES
Jaime H. Cuadros, Gerald L. Winchenbach (General Dynamics, Pomona, Calif.), and Billy F. Lucas May 1981 18 p refs
(AD-A111780) Avail: NTIS HC A02/MF A01 CSCL 19/4

An evaluation of four tracer rounds at subsonic Mach numbers was conducted. This evaluation indicates that three of the four subsonic tracer rounds posesses large dispersion characteristics. The fourth round, the 7.62 mm NATO round, has acceptable dispersion characteristics; however, even this round demonstrated a dynamic instability at the subsonic Mach numbers. It is found that this instability can be characterized by a growing precessional vector and it is present with or without the tracer ignited. Data indicates that the instability is tolerable when the tracer is ignited because of its small effect on the dispersion of the round. T.M.

N82-25230# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.
THE FFA WING BODY 81 COMPUTER PROGRAM. A PANEL METHOD FOR DETERMINATION OF AERODYNAMIC CHARACTERISTICS AT SUBSONIC AND SUPERSONIC SPEEDS
Sven G. Hedman and Lars G. Tysell 1982 36 p refs
(Contract FMV-F-INK-82223-78-170-21-001)
(FFA-TN-AU-1601) Avail: NTIS HC A03/MF A01

A panel program is extended in order to account for unsymmetric configurations and flow fields symmetric, antisymmetric or unsymmetric to the vertical plane. Input instructions are given. The program calculates pressure distribution for completely specified geometries, wing camber for given load distributions, and wing camber for minimum drag with given values of lift and pitching moment. The body length is divided into intervals each with a distribution of sources or doublets of either constant or linearly varying intensity. The boundary condition is fulfilled on the body surface midway between the ends of an interval. Compressible velocities are obtained by the Goethert rule and alternatively for the wing by a semiempirical compressibility correction method, based on the nonlinear compressibility effects in the flow about two-dimensional and sheared wings. Comparison of results with known data shows that the program works best for subsonic load calculations, involving elastic airplanes.
Author (ESA)

N82-25231# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
MODIFIED VERSION OF LTRAN2: A CALCULATION

METHOD FOR INVISCID TRANSONIC FLOW ABOUT THIN AIRFOILS IN MODERATELY SLOW UNSTEADY MOTION
J. vanderVooren and G. H. Huizing 26 Jun. 1980 54 p refs (Contract NIVR-1814)
(NLR-TR-80059-U) Avail: NTIS HC A04/MF A01

A method for strictly slow unsteady motions is modified by including extra unsteady terms in the boundary conditions. The unsteady transonic small perturbation equation and the airfoil, wake and far field boundary conditions are derived heuristically. A radiation condition on the far field boundary which accommodates outgoing disturbances only is presented. Analysis shows that the infinite physical domain surrounding the airfoil can not be mapped onto a finite computational domain. Numerical experiments on an airfoil oscillating in pitch at reduced frequencies 0.05 and 0.1 for a freestream Mach number = 0.85, and zero angle of attack show that radiation condition can reduce the computational domain and the number of grid points.
Author (ESA)

N82-25232# National Aerospace Lab., Amsterdam (Netherlands). Informations Div.
COMPARISON OF BOUNDARY LAYER CALCULATIONS FOR THE ROOT SECTION OF A WING. THE SEPTEMBER 1979 AMSTERDAM WORKSHOP TEST CASE
J. P. F. Lindhout, B. vandenBerg, and A. Elsenaar 6 Mar. 1981 71 p refs
(NLR-MP-80028-U) Avail: NTIS HC A04/MF A01

Integral and field method calculations of three-dimensional turbulent boundary layer development, including separation, on the root section of a swept wing are compared. Although the predicted position of the separation region varies, all methods give a good global impression of the state of the nonseparated part of the three-dimensional boundary layer. In the weakly three-dimensional region of the flow, agreement between the results is very good. In the strongly three-dimensional region, variation is considerable. Field methods vary more than integral methods. The integral methods are on average ten times faster than the field methods. Author (ESA)

N82-25233# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehfluegler.
THE PROBLEM OF CALCULATION OF THE FLOW AROUND HELICOPTER ROTOR BLADE TIPS
H. Stahl 19 Aug. 1981 22 p refs Presented at 7th European Rotorcraft and Powered Lift Aircraft Forum, Garmisch-Partenkirchen, West Germany, 8-11 Sep. 1981; sponsored by DGLR
(MBB-UD-330-81-O) Avail: NTIS HC A02/MF A01

Computational problems that arise with the theoretical analysis of the flow around rotary wing blade tips are evoked. The modification of existing computer programs in order to handle three-dimensional, unsteady, rotational flow that, on the advancing blade in fast forward flight, can also be transonic is discussed. Potential flow theory is presented. A program for steady three-dimensional flow past a fixed wing was adapted for a rotating blade, taking into account the irrotational condition of the applied theory. Calculations show that this approach leads to an acceptable description of the actual flow. Author (ESA)

N82-25234# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehfluegler und Verkehr.
PROGRAM PRESENTATION OF THE WORKING GROUP SEPARATED FLOW: PROBLEMS WITH ROTARY WINGS [PROGRAM-PRAESENTATION DER ARBEITSGEMEINSCHAFT STROEMUNGEN MIT ABLOESUNGEN (STAB): THEMENKREIS DREHFLUEGEL]
G. Polz 19 Mar. 1981 19 p In GERMAN
(MBB-UD-336-81-O) Avail: NTIS HC A02/MF A01

With reference to propellers and rotors, relevant separation phenomena and their resulting effects are described. These include stress induced separation at the blade tip associated with high Mach numbers, separation due to exceeding maximum lift for low Mach numbers, and vortex induced separation. Cause/effect relationships with advancing blade tip vortices are emphasized. All of these separation phenomena have a negative influence on performance and economy in flight management. As for helicopter rotors, the identified extremely high dynamic flight loads can cause acute structural loading and vibration. Minimization of flow separation and its effects is possible by improving blade profiles, optimizing blade shapes (planform/warpage), and by developing blade tips. Author (ESA)

N82-26162# Indian Inst. of Tech., Bombay. Dept. of Aeronautical Engineering.
INVESTIGATION ON ROTATING AILERONS
S. Mozumdar and T. S. Patel *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 1-5 refs (For primary document see N82-26161 16-99)
Avail: NTIS HC A08/MF A01

N82-26175# Indian Inst. of Tech., Madras. Dept. of Aeronautical Engineering.
DOWNWASH BEHIND A WING WITH SPANWISE BLOWING
P. Ramesh Kumar and E. G. Tulapurkara *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 p 105-108 A01 refs (For primary document see N82-26161 16-99)
Avail: NTIS HC A08/MF A01

N82-26182# National Aeronautical Lab., Bangalore (India). Aerodynamics Div.
JET SIMULATION STUDIES IN THE 1.2M WIND TUNNEL
O. A. Lokhandwala, N. B. Mathur, and Jai Mohan *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 137-142 refs (For primary document see N82-26161 16-99)
Avail: NTIS HC A08/MF A01

N82-26186# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
EXPERIMENTAL STUDY BY LASER VELOCIMETRY OF THE INTERACTION OF AN OBLIQUE JET WITH A SUBSONIC FLOW
M. Izard and J. Labbe *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1981-6, Nov.-Dec. 1981 (ESA-TT-741) Mar. 1982 p 1-15 refs Transl. by ONERA into ENGLISH from 'La Rech. Aerospatiale, Bull. Bimestriel (Paris) No. 1981-6, Nov.-Dec. 1981' (For primary document see N82-26185 16-99)
Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 55

N82-26190# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
APPROXIMATE COMPRESSIBILITY LAWS AND SOLUTIONS OF EULER'S EQUATIONS
H. Viviand *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1981-6, Nov.-Dec. 1981 (ESA-TT-741) Mar. 1982 p 61-62 refs Transl. by ONERA into ENGLISH from 'La Rech. Aerospatiale, Bull. Bimestriel (Paris) No. 1981-6, Nov.-Dec. 1981' (For primary document see N82-26185 16-99)
Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 55

N82-26191# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
CONTRIBUTION TO THE CALCULATION OF TRANSONIC FLOWS USING AN IMPLICIT PSEUDO-UNSTEADY METHOD
M. Abdelrahman *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1981-6, Nov.-Dec. 1981 (ESA-TT-741) Mar. 1982 p 63-66 refs Transl. by ONERA into ENGLISH from 'La Rech. Aerospatiale, Bull. Bimestriel (Paris) No. 1981-6, Nov.-Dec. 1981' (For primary document see N82-26185 16-99)
Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 55

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N82-25179# Dayton Univ., Ohio. Research Inst.
THE EFFECT OF VERY HEAVY RAIN UPON AIRCRAFT AND ITS ROLE IN WIND SHEAR ATTRIBUTED ACCIDENTS
P. A. Haines and J. K. Luers *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 185-215 refs (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

N82-26184# CIERS Research and Consultancy Private Ltd., Bangalore (India).
PRIMARY SEWAGE TREATMENT PLANT AS A SOURCE OF BIRD HAZARDS AT AIRPORT
S. C. Pillai, M. K. C. Sridhar, and G. Kasi Viswanath *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 149-153 refs (For primary document see N82-26161 16-99)
Avail: NTIS HC A08/MF A01

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N82-25235*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EVALUATION OF A VOICE RECOGNITION SYSTEM FOR THE MOTAS PSEUDO PILOT STATION FUNCTION
Jacob A. Houck Apr. 1982 57 p refs
(NASA-TM-84487; NAS 1.15:84487) Avail: NTIS HC A04/MF A01 CSCL 17G

The Langley Research Center has undertaken a technology development activity to provide a capability, the mission oriented terminal area simulation (MOTAS), wherein terminal area and aircraft systems studies can be performed. An experiment was conducted to evaluate state-of-the-art voice recognition technology and specifically, the Threshold 600 voice recognition system to serve as an aircraft control input device for the MOTAS pseudo pilot station function. The results of the experiment using ten subjects showed a recognition error of 3.67 percent for a 48-word vocabulary tested against a programmed vocabulary of 103 words. After the ten subjects retrained the Threshold 600 system for the words which were misrecognized or rejected, the recognition error decreased to 1.96 percent. The rejection rates for both cases were less than 0.70 percent. Based on the results of the experiment, voice recognition technology and specifically the Threshold 600 voice recognition system were chosen to fulfill this MOTAS function. Author

N82-25236*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
AN AIRCRAFT SENSOR FAULT TOLERANT SYSTEM Interim Report
Alper K. Caglayan and Roy E. Lancraft Apr. 1982 113 p refs
(Contract NAS1-16579)
(NASA-CR-165876; NAS 1.26:165876; BBN-4858) Avail: NTIS HC A06/MF A01 CSCL 17G

The design of a sensor fault tolerant system which uses analytical redundancy for the Terminal Configured Vehicle (TCV) research aircraft in a Microwave Landing System (MLS) environment was studied. The fault tolerant system provides reliable estimates for aircraft position, velocity, and attitude in the presence of possible failures in navigation aid instruments and onboard sensors. The estimates, provided by the fault tolerant system, are used by the automated guidance and control system to land the aircraft along a prescribed path. Sensor failures are identified by utilizing the analytic relationship between the various sensor outputs arising from the aircraft equations of motion.
E.A.K.

N82-25237# Aerospace Corp., El Segundo, Calif. Guidance and Control Div.
MULTI-BODY GIMBAL SERVO SYSTEM SIMULATION MODEL Final Report
P. R. Dahl 10 Dec. 1981 45 p refs
(Contract F04701-80-C-0081)
(AD-A111396; TR-0082(2757-01)-1; SD-TR-81-93) Avail: NTIS HC A03/MF A01 CSCL 17/7

The equations of motion of a multi-body gimbal servo system for simulation purposes are derived using a free body momentum formulation that is maintained throughout the development, thereby retaining the original variables defined in the beginning of the model formulation. By avoiding undesirable algebraic manipulation and transformation of the original variables, a simplification is achieved in evolving and understanding a complex computer simulation model that can be debugged and run with enhanced insight to the physical process being simulated. In the formulation, translational motion is permitted for each gimbal frame, but a translational momentum conservation constraint for the system of 'rigidly' connected bodies is invoked to avoid solution of translational equations of motion for each body. A four-body example is presented where the bodies are simply connected in a series configuration, such as would represent a spacecraft with controlled gimballed appendages.
Author (GRA)

N82-25238# Army Missile Command, Redstone Arsenal, Ala. Guidance and Control Directorate.
NORTH-FINDING MODULE EVALUATION
S. G. McDaniel and H. V. White Apr. 1981 35 p
(AD-A111346; AD-E950202; DRSMI/RG-81-24-TR) Avail: NTIS HC A03/MF A01 CSCL 17/7

A Litton north-finding module was studied to determine its absolute azimuth accuracy and repeatability. Results indicate the north-finding module can determine azimuth heading with reasonable accuracy in a laboratory environment. The unit will be used in an in-house program to demonstrate its potential as an azimuth heading transfer system for tactical missile systems which do not have on-board self-alignment capability.
Author (GRA)

N82-25175# Eurocontrol Agency, Brussels (Belgium).
ON-LINE EXPERIMENTS IN ACQUIRING AND EXPLOITING AIDS DATA FOR ATC PURPOSES
M. E. Cox *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 93-114 refs (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

N82-25176# Vereinigung Cockpit, Frankfurt am Main (West Germany).
A PILOT'S VIEW ON POSSIBLE USES OF AIDS
Christian Denke *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 125-130 (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

N82-25185# Technische Universitaet, Brunswick (West Germany). Lehrstuhl fuer Flugmechanik.
GROUND SPEED MEASUREMENT FROM DME/VHF OMNIRANGE NAVIGATION (VOR) DATA
P. Voersmann *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 359-380 refs (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

N82-25239*# Hampton Inst., Va.
[COST AND FUEL CONSUMPTION PER NAUTICAL MILE FOR TWO ENGINE JET TRANSPORTS USING OPTIM AND TRAGEN] Final Report
John F. Wiggs 30 Apr. 1982 280 p
(Grant NAG1-69)
(NASA-CR-168973; NAS 1.26:168973) Avail: NTIS HC A13/MF A01 CSCL 01C

The cost and fuel consumption per nautical mile for two engine jet transports are computed using OPTIM and TRAGEN. The savings in fuel and direct operating costs per nautical mile for each of the different types of optimal trajectories over a standard profile are shown. S.L.

N82-25240*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LEADING EDGE FLAP SYSTEM FOR AIRCRAFT CONTROL AUGMENTATION Patent Application
Dhanvada M. Rao, inventor (to NASA) (Old Dominion Univ.) Filed 10 Sep. 1981 15 p Sponsored by NASA
(NASA-Case-LAR-12787-1; US-Patent-Appl-SN-301078) Avail: NTIS HC A02/MF A01 CSCL 01C

Traditional roll control systems such as ailerons, elevons or spoilers are least effective at high angles of attack due to boundary layer separation over the wing. Independently deployed leading edge flaps on the upper surfaces of vortex stabilized wings are used to shift the center of lift outboard. A rolling moment is created that is used to control roll in flight at high angles of attack. The effectiveness of the rolling moment increases linearly with angle of attack. No adverse yaw effects are induced. In an alternate mode of operation, both leading edge flaps are deployed together at cruise speeds to create a very effective airbrake without appreciable modification in pitching moment. Little trim change is required. NASA

N82-25241*# National Aeronautics and Space Administration, Washington, D. C.
AERODYNAMICS/ACEE: AIRCRAFT ENERGY EFFICIENCY
1981 8 p refs
(NASA-Facts-94/8-81) Avail: NTIS HC A02/MF A01 CSCL 01C

An overview is presented of a 10 year program managed by NASA which seeks to make possible the most efficient use of energy for aircraft propulsion and lift as well as provide a technology that can be used by U.S. manufacturers of air transports and engines. Supercritical wings, winglets, vortex drag reduction, high lift, active control, laminar flow control, and aerodynamics by computer are among the topics discussed. Wind tunnel models in flight verification of advanced technology, and the design, construction and testing of various aircraft structures are also described. A.R.H.

N82-25242*# National Aeronautics and Space Administration, Washington, D. C.
MATERIALS AND STRUCTURES/ACEE
1981 8 p
(NASA-Facts-117/8-81) Avail: NTIS HC A02/MF A01 CSCL 01C

Light weight composites made from graphite fibers, glass, or man made materials held in an epoxy matrix, and their application to airframe design are reviewed. The Aircraft Energy Efficiency program is discussed. Characteristics of composites, acceptable risks, building parts and confidence, and aeroelastic tailoring are considered. N.W.

N82-25243# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
STATISTICAL REVIEW OF COUNTING ACCELEROMETER DATA FOR NAVY AND MARINE FLEET AIRCRAFT FROM 1 JANUARY 1962 TO 30 JUNE 1981 Semiannual Summary Report
Warren J. Williams 1 Nov. 1981 149 p
(AD-A110660; NADC-13920-2) Avail: NTIS HC A07/MF A01 CSCL 01/1

This is a semi-annual progress report, and it presents a specialized summary of the data in the counting accelerometer program. Statistics describing Navy and Marine aircraft cumulative g-count exceedances are calculated and tabulated. These tabulations are separated by calendar time and into four major categories of fleet experience: Navy Training, Navy Combat, Marine Training, and Marine Combat. These data show that the load rate distributions (counts at 1000 hours) for most models and most g-levels have a non-normal distribution. Within a model (A-7E, F-4N, etc.) differences in the average load rates exist when data are separated by calendar time or mission category. Author (GRA)

N82-25244# San Antonio Air Logistics Center, Kelly AFB., Tex.
OV-10A NOSE GEAR FORK DAMAGE ANALYSIS Final Report, Aug. 1980 - Sep. 1981
Kenneth F. Barnes and James L. Haines Jan. 1982 49 p refs
(AD-A111492; SA-ALC/MM-7588) Avail: NTIS HC A03/MF A01 CSCL 03/1

A limited Damage Tolerance Analysis (DTA) of the OV-10A nose gear fork was performed to determine the fracture characteristics at a location on the underside of the fork in a machined fillet radius just aft of the jack point. The analysis included determination of a landing load history, finite element stress analysis, stress spectrum development, stress intensity solution, crack growth analysis, and residual strength calculations. Author (GRA)

N82-25245# Boeing Military Airplane Development, Seattle, Wash. Advanced Airplane Branch.
FIREPROOF BRAKE HYDRAULIC SYSTEM Final Report, Jun. 1980 - Jun. 1981
S. M. Warren and J. R. Kilner Wright-Patterson AFB, Ohio AFWAL Sep. 1981 391 p refs
(Contract F33615-80-C-2026; AF Proj. 3145)
(AD-A111319; AFWAL-TR-81-2080) Avail: NTIS HC A17/MF A01 CSCL 01/2

The feasibility of a fireproof two-fluid brake hydraulic system which utilizes nonflammable chlorotrifluoroethylene (CTFE) fluid in a dead ended brake hydraulic system mechanically isolated from the primary MIL-H-5606 hydraulic system was studied. Experimental brake system hardware was designed, built and laboratory tested. Results indicate that the fireproof two-fluid brake hydraulic system concept is feasible, and the basic operation, control characteristics and stability of the brake system are not affected by the two-fluid configuration. The increased density of the CTFE fluid does not cause the hydraulic system to respond slower resulting in longer aircraft stopping distances. However, analysis indicates that the performance lost by changing to the CTFE fluid can be regained by increasing brake hydraulic line sizes and returning the antiskid control box. Author (GRA)

N82-25246# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
INVESTIGATION OF A TWO-DIMENSIONAL MODEL FOR THE PREDICTION OF STATIC DISPLACEMENT FOR T-38 HORIZONTAL STABILATORS USING NASTRAN M.S. Thesis
Jack Orin Sawdy Dec. 1981 104 p refs
(AD-A111100; AFIT/GAE/AA/81D-27) Avail: NTIS HC A06/MF A01 CSCL 01/1

This report documents the results of the experimental tests performed on a T-38 horizontal stabilator and the investigation of a two-dimensional finite element model for prediction of static displacement using NASA structural analysis (NASTRAN) computer program. The finite element model was used in previous and concurrent theses efforts with regard to T-38 flutter prediction via NASTRAN modal analysis methods. It will also be used in future analyses by a Using Air Force Agency for flutter prediction. The experimental test set-up for the stabilator measured the displacements in the downward (water line) direction for ten

load conditions with the displacements measured at twenty-five locations for each of the loading conditions. The results of the experimental tests were compared with those developed using NASTRAN. Several of the model characteristics were altered and investigated as to their effect on the prediction of the static displacement. The analytical displacements were compared with those achieved experimentally. Finally, development of an optimization procedure is presented, as well as its application to tuning the finite element model. GRA

N82-25247# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.
BEARINGLESS ROTOR SYSTEMS
W. Buchs, P. M. Wackerle, and K. Brunsch 1981 23 p refs Presented at European chapter SAMPE Intern. Conf. on Adv. Technol. in Mater. Eng., Cannes, France, 12-14 Jan. 1981
(MBB-UD-338-81-O) Avail: NTIS HC A02/MF A01

Three bearingless helicopter rotors (two tail rotors; one main rotor) were developed, regarding design, manufacturing and testing. Dynamic structural analysis led to the choice of baseline design requirements. Design details, such as materials selection and fiber orientation, are given. Tooling concepts are outlined in order to introduce manufacturing processes for low cost production. Tests performed on components and subassemblies demonstrate the feasibility of these pure composite rotors and confirm the structural layout. A comparison with existing production rotors shows that considerable mass, cost and reliability advantages are achieved by the use of these rotors. Control forces equal to those for conventional systems are obtained with the main rotor and a four-bladed tail rotor. The three-bladed tail rotor needs higher control forces, but no hydraulic actuator appears necessary. Author (ESA)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N82-25248# Arinc Research Corp., Annapolis, Md.
IMPROVEMENT PROGRAM FOR THE C-141 NAVIGATION SELECTOR PANEL Final Engineering Report
Henry L. Riser, Jr. Jan. 1982 20 p
(Grant F09603-80-G-3338-0012)
(AD-A111469; Rept-2315-11-1-2635) Avail: NTIS HC A02/MF A01 CSCL 01/4

This report presents the results of an engineering study to improve the reliability and maintainability of the Navigation Selector Panel, Part Number 75-89181, NSN 6605-01-038-6849JH, used in all models of the C-141 aircraft. The work described in this document was performed for the U. S. Air Force and specifically for the Reliability Engineering Branch, Item Management Division, MMIRCA-4, of Robins Air Force Base, Georgia, 31098. Maintenance date covering one year were obtained and analyzed. The items most often replaced were the lighted push-button switches in the assembly caused by poor switch design. Changes were recommended. Author (GRA)

N82-25249# Arinc Research Corp., Annapolis, Md.
ELECTRONIC WARFARE AVIONICS INTEGRATION SUPPORT FACILITY SUPPORT PROCESSOR Final Report
C. J. Manspeaker, F. M. Stamps, and C. W. Strack Nov. 1981 217 p refs
(Grant F09603-80-G-3338-0011)
(AD-A111641; Rept-2311-11-1-2568) Avail: NTIS HC A10/MF A01 CSCL 09/3

ARINC Research was tasked to perform a long-range study of the functional and system requirements of the Electronic Warfare Avionics Integration Support Facility (EWAISF) support processor. This document describes the results of the four phases of that effort: the definition of functional requirements for data processing equipment (ADPE) and Software, identification of alternative architectures to fulfill these requirements, and a cost benefit analysis of the alternatives. Also recommendations for implementing a preferred architecture and describes a means for updating the study are given. Author (GRA)

N82-25172# Sperry Univac, St. Paul, Minn.
SOLID-STATE FLIGHT INCIDENT RECORDER
D. Amundson *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 17-31 refs (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

N82-25180# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Forschungszentrum.
THE DFVLR DIGITAL FLIGHT DATA READOUT AND PROCESSING STATION AND ITS UTILITY
H. Hardegen *In its* Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 217-245 (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

N82-25181# Lufthansa German Airlines, Hamburg (West Germany).
SIDESLIP INDICATION SYSTEM AS A FUEL SAVING AID IN JET TRANSPORT AIRCRAFT OPERATION
Dieter Horst *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 247-275 (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

N82-25187# Naval Air Test Center, Patuxent River, Md. Systems Engineering Test Directorate.
U.S. NAVY UNIVERSAL LOCATOR AIRBORNE INTEGRATED DATA SYSTEM (ULAIDS)
Daniel M. Watters *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 395-417 (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N82-25250*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STGSTK: A COMPUTER CODE FOR PREDICTING MULTISTAGE AXIAL FLOW COMPRESSOR PERFORMANCE BY A MEANLINE STAGE STACKING METHOD
Ronald J. Steinke May 1982 65 p refs
(NASA-TP-2020; E-551; NAS 1.60:2020) Avail: NTIS HC A04/MF A01 CSCL 21E

A FORTRAN computer code is presented for off-design performance prediction of axial-flow compressors. Stage and compressor performance is obtained by a stage-stacking method that uses representative velocity diagrams at rotor inlet and outlet meanline radii. The code has options for: (1) direct user input or calculation of nondimensional stage characteristics; (2) adjustment of stage characteristics for off-design speed and blade setting angle; (3) adjustment of rotor deviation angle for off-design conditions; and (4) SI or U.S. customary units. Correlations from experimental data are used to model real flow conditions. Calculations are compared with experimental data. Author

N82-25251*# National Aeronautics and Space Administration, Washington, D. C.
PROPULSION/ACEE
1981 12 p
(NASA-Facts-93/8-81) Avail: NTIS HC A02/MF A01 CSCL 21E

The research objectives of the NASA aircraft energy efficiency program are summarized. Engine component improvements for turbofan engines, diagnostics, the development of advanced turboprop engines, and propeller noise analysis are discussed.
M.G.

N82-25252*# Pennsylvania State Univ., University Park. Lab. of Turbomachinery.
THREE DIMENSIONAL MEAN VELOCITY AND TURBULENCE CHARACTERISTICS IN THE ANNULUS WALL REGION OF AN AXIAL FLOW COMPRESSOR ROTOR PASSAGE
R. Davino and B. Lakshminarayana May 1982 262 p refs (Grant NsG-3212)
(NASA-CR-169003; NAS 1.26:169003; PSU/TURBO-82-2) Avail: NTIS HC A12/MF A01 CSCL 21E

The experiment was performed using the rotating hot-wire technique within the rotor blade passage and the stationary hot-wire technique for the exitflow of the rotor blade passage. The measurements reveal the effect of rotation and subsequent flow interactions upon the rotor blade flowfield and wake development in the annulus-wall region. The flow near the rotor blade tips is found to be highly complex due to the interaction of the annulus-wall boundary layer, the blade boundary layers, the tip leakage flow, and the secondary flow. Within the blade passage, this interaction results in an appreciable radial inward flow as well as a defect in the mainstream velocity near the mid-passage. Turbulence levels within this region are very high. This indicates a considerable extent of flow mixing due to the viscous flow interactions. The size and strength of this loss core is found to grow with axial distance from the blade trailing edge. The nature of the rotor blade exit-flow was dominated by the wake development.
T.M.

N82-25253*# Pennsylvania State Univ., University Park. Lab. of Turbomachinery.
INVESTIGATION OF THE TIP CLEARANCE FLOW INSIDE AND AT THE EXIT OF A COMPRESSOR ROTOR PASSAGE
A. Pandya and B. Lakshminarayana May 1982 147 p refs (Grant NsG-3212)
(NASA-CR-169004; NAS 1.26:169004; PSU/TURBO-82-3) Avail: NTIS HC A07/MF A01 CSCL 21E

The nature of the tip clearance flow in a moderately loaded compressor rotor is studied. The measurements were taken inside the clearance between the annulus-wall casing and the rotor blade tip. These measurements were obtained using a stationary two-sensor hot-wire probe in combination with an ensemble averaging technique. The flowfield was surveyed at various radial locations and at ten axial locations, four of which were inside the blade passage in the clearance region and the remaining six outside the passage. Variations of the mean flow properties in the tangential and the radial directions at various axial locations were derived from the data. Variation of the leakage velocity at different axial stations and the annulus-wall boundary layer profiles from passage-averaged mean velocities were also estimated.
B.W.

N82-25254*# General Electric Co., Evendale, Ohio. Materials and Processes Technology Labs.
COST/BENEFIT STUDIES OF ADVANCED MATERIALS TECHNOLOGIES FOR FUTURE AIRCRAFT TURBINE ENGINES: MATERIALS FOR ADVANCED TURBINE ENGINES
M. Stearns and L. Wilbers May 1982 49 p
(Contract NAS3-20074)
(NASA-CR-167849; NAS 1.26:167849) Avail: NTIS HC A03/MF A01 CSCL 21E

Cost benefit studies were conducted on six advanced materials and processes technologies applicable to commercial engines planned for production in the 1985 to 1990 time frame. These technologies consisted of thermal barrier coatings for combustor and high pressure turbine airfoils, directionally solidified eutectic high pressure turbine blades, (both cast and fabricated), and mixers, tail cones, and piping made of titanium-aluminum alloys. A fabricated titanium fan blisk, an advanced turbine disk alloy with improved low cycle fatigue life, and a long-life high pressure turbine blade abrasive tip and ceramic shroud system were also analyzed. Technologies showing considerable promise as to benefits, low development costs, and high probability of success were thermal barrier coating, directionally solidified eutectic turbine blades, and abrasive-tip blades/ceramic-shroud turbine systems.
R.J.F.

N82-25255*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXHAUST EMISSIONS SURVEY OF A TURBOFAN ENGINE FOR FLAME HOLDER SWIRL TYPE AUGMENTORS AT SIMULATED ALTITUDE FLIGHT CONDITIONS
John E. Moss, Jr. Oct. 1981 47 p refs
(NASA-TM-82787; E-955; NAS 1.15:82787) Avail: NTIS HC A03/MF A01 CSCL 21E

Emissions of carbon dioxide, total oxides of nitrogen, unburned hydrocarbons, and carbon monoxide from an F100 afterburning two spool turbofan engine at simulated flight conditions are reported. Tests were run at Mach 0.8 at altitudes of 10.97 and 13.71 km (36,000 and 45,000 ft), and at Mach 1.2 at 13.71 km (45,000 ft). Emission measurements were made from intermediate power (nonafterburning) through maximum afterburning, using a single point gas sample probe traversed across the horizontal diameter of the exhaust nozzle. The data show that emissions vary with flight speed, altitude, power level, and radial position across the nozzle. Carbon monoxide emissions were low for intermediate and partial afterburning power. Unburned hydrocarbons were near zero for most of the simulated flight conditions. At maximum afterburning, there were regions of NOx deficiency in regions of high CO. The results suggest that the low NOx levels observed in the tests are a result of interaction with high CO in the thermal converter. CO2 emissions were proportional to local fuel air ratio for all test conditions.
T.M.

N82-25256*# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
DEVELOPMENT OF AN ANALYTICAL TECHNIQUE FOR THE OPTIMIZATION OF JET ENGINE AND DUCT ACOUSTIC LINERS Final Technical Report, 1 Mar. 1981 - 28 Feb. 1982
Ben T. Zinn and William L. Meyer 28 Feb. 1982 159 p refs (Grant NAG1-133)
(NASA-CR-169002; NAS 1.26:169002) Avail: NTIS HC A08/MF A01 CSCL 21E

A new method was developed for the calculation of optimum constant admittance solutions for the minimization of the sound radiated from an arbitrary axisymmetric body. This method utilizes both the integral equation technique used in the calculation of the optimum non-constant admittance liners and the independent solution generated as a by product of these calculations. The results generated by both these methods are presented for three duct geometries: (1) a straight duct; (2) the QCSEE inlet; and (3) the QCSEE inlet less its centerbody.
Author

N82-25257*# United Technologies Corp., East Hartford, Conn. Commercial Products Div.
FRACTURE MECHANICS CRITERIA FOR TURBINE ENGINE HOT SECTION COMPONENTS Final Report
G. J. Meyers May 1982 123 p refs
(Contract NAS3-22550)
(NASA-CR-167896; NAS 1.26:167896; PWA-5772-23) Avail: NTIS HC A06/MF A01 CSCL 21E

The application of several fracture mechanics data correlation parameters to predicting the crack propagation life of turbine engine hot section components was evaluated. An engine survey was conducted to determine the locations where conventional fracture mechanics approaches may not be adequate to characterize cracking behavior. Both linear and nonlinear fracture mechanics analyses of a cracked annular combustor liner configuration were performed. Isothermal and variable temperature crack propagation tests were performed on Hastelloy X combustor liner material. The crack growth data was reduced using the stress intensity factor, the strain intensity factor, the J integral, crack opening displacement, and Tomkins' model. The parameter which showed the most effectiveness in correlation high temperature and variable temperature Hastelloy X crack growth data was crack opening displacement.
S.L.

N82-25258# Sheffield Univ. (England). Dept. of Chemical Engineering and Fuel Technology.
FUNDAMENTAL STUDY OF THREE-DIMENSIONAL TWO-PHASE FLOW IN COMBUSTION SYSTEMS Annual Report, 1980 - 1981
B. Ewan and J. Swithenbank Aug. 1981 6 p refs
(Grant AF-AFOSR-0174-80; AF Proj. 2308)
(AD-A111526; AFOSR-82-0078TR) Avail: NTIS HC A02/MF A01 CSCL 21/5

A fundamental approach to combustor modelling is being extended by the coupling of combustor flow fields and fuel droplet trajectories. The iterative procedures, which have been applied to a gas turbine, evaluate reacting flow fields and indicate the conditions under which fuel is able to escape incompletely evaporated from the burner. Important advances have also been made in the application of a valid turbulence model to the calculation of flow fields in non-isotropic swirling flows. This has important implications for combustor designing for a wide range of systems including gas turbines and ramjets. The development of a non-intrusive and rapid method for residence time distribution measurement has progressed to the point of application to a gas turbine combustor. This involves the optical detection of an electrically generated pulse of mercury vapor and can give residence times in real time. Author (GRA)

N82-25259# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Ramjet Technology Branch.
COAXIAL DUMP RAMJET COMBUSTOR COMBUSTION INSTABILITIES. PART 1: PARAMETRIC TEST DATA Interim Report, Feb. 1979 - Mar. 1980
D. L. Davis Jul. 1981 333 p refs 2 Vol.
(AF Proj. 2308)
(AD-A111355; AFWAL-TR-81-2047-Pt-1) Avail: NTIS HC A15/MF A01 CSCL 21/5

This report contains Combustion Instability Data for Coaxial Dump Ramjet Combustors. The data includes pressure vs. time, RMS pressure spectrums, peak and broadband RMS pressures, and related steady state performance data. Analysis and interpretation of the data are reserved for future reports. Also included is a description of RMS pressure and its relation to wave shape. Author (GRA)

N82-25260# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Raumfahrt.
NEW DEVELOPMENTS IN THE FIELD OF RAMJET MISSILE PROPULSION [NEUE ENTWICKLUNGEN AUF DEM GEBIET DER FLUGKOERPER-STAUANTRIEBE]
H.-L. Weinreich 12 Nov. 1981 65 p refs In GERMAN
(MBB-UR-516-81-O) Avail: NTIS HC A04/MF A01

Various supersonic ramjets are discussed which were proposed for the propulsion systems of tactical missiles with higher average velocities. Design and general operating characteristics of ramjet engines are reviewed. The interaction between intake system and ramjet combustion chamber performance is treated with reference to throttling schemes. Ramjet engines, using liquid or solid propellant, as well as solid fuel ramrockets are studied. Experimentally proven performance of ramjet designs is cited and technological trends are identified. Development results concern fuel, inlet systems, variable thrust chokes; and ramjet combustion chamber/integral booster configurations. Author (ESA)

N82-25184# United Technologies Corp., Windsor Locks, Conn.
GAS PATH ANALYSIS OF COMMERCIAL AIRCRAFT ENGINES
Louis A. Urban *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 323-357 (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

N82-25189# British Aluminum Co., Ltd., London (England).
ANALYSIS OF TRANSIENT DATA FROM AIRCRAFT GAS TURBINE ENGINES USING AIDS
E. R. White *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p441-453 (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

N82-26181# Indian Inst. of Tech., Bombay. Dept. of Aeronautical Engineering.
DESIGN, FABRICATION AND TESTING OF AN ELECTRICAL ANALOGUE FOR HEAT TRANSFER TO COATED TURBINE BLADE
P. R. Joshi and W. V. Nabar *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 12, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 133-136 (For primary document see N82-26161 16-99)
Avail: NTIS HC A08/MF A01

N82-26189# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
AEROELASTICY OF COMPRESSOR BLADES: SUBSONIC STALL FLUTTER
H. Loiseau and E. Szechenyi *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1981-6, Nov.-Dec. 1981 (ESA-TT-741) Mar. 1982 p 47-59 refs Transl. by ONERA into ENGLISH from 'La Rech. Aerospatiale, Bull. Bimestriel (Paris) No. 1981-6, Nov.-Dec. 1981' (For primary document see N82-26185 16-99)
Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 55

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N82-25261*# National Aeronautics and Space Administration, Washington, D. C.
GUIDANCE AND CONTROL/ACEE
1981 8 p
(NASA-Facts-95/8-81) Avail: NTIS HC A02/MF A01 CSCL 01C

Active controls improve airplane performance by stabilizing its flight, reducing departures from stable flight, and alleviating loads imposed by external forces such as gusts, turbulence, or maneuvers. Some uses for active control systems, the design of redundant and reliable stability augmentation systems, digital fly-by-wire, and NASA assessments of the technology of sensors and actuators are discussed. A series of trade-off studies to better define optimum flight control systems, and research by drone and full-scale models are described. A.R.H.

N82-25262*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
BARRIERS AND DISPERSAL SURFACES IN MINIMUM-TIME INTERCEPTION
N. Rajan and M. D. Ardema May 1982 34 p refs
(NASA-TM-84241; A-8912; NAS 1.15:84241) Avail: NTIS HC A03/MF A01 CSCL 01C

Minimum time interception of a target moving in a horizontal plane is analyzed as a one-player differential game. Dispersal points and points on the barrier are located for a class of pursuit evasion and interception problems. These points are determined by constructing cross sections of the isochrones and hence obtaining the barrier, dispersal, and control level surfaces. The game solution maps the controls as a function of the state within the capture region. J.D.

N82-25263# Washington Univ., St. Louis, Mo. Dept. of Mechanical Engineering.
OPTIMIZATION OF AUTO-PILOT EQUATIONS FOR RAPID ESTIMATION OF HELICOPTER CONTROL SETTINGS Interim Technical Report, Jul. 1980 - Nov. 1981
Han-Sheng Chen and David A. Peters Nov. 1981 29 p refs
(Contract DAAG29-80-C-0092)
(AD-A110739; ARO-17067.1-E; ITR-1) Avail: NTIS HC A03/MF A01 CSCL 01/1

An automatic feedback system, based on continuous monitoring of control loads, is used to find the control settings that are required to obtain a given flight condition of a helicopter rotor. A program is developed that searches automatically for the optimum gains and time constants of the system. Satisfac-

tory results are achieved for given conditions as an example.
Author (GRA)

N82-25264# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
USE OF THE PSEUDO-INVERSE FOR DESIGN OF A RECONFIGURABLE FLIGHT CONTROL SYSTEM M.S. Thesis
Syed Javed Raza Dec. 1981 156 p refs
(AD-A111172; AFIT/GAE/AA/81D-23) Avail: NTIS HC A08/MF A01 CSCL 01/3

Reconfiguration of the flight control system is achieved using generic inputs and transformation matrices for single primary control surface failure. Pseudo-inverse is used to evaluate appropriate transformation matrices. Design is tested against non-linear six degree-of-freedom model of the A-7D by simulating failure flights. System was found to provide desirable flying qualities upon reconfiguration. Author (GRA)

N82-25265# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
ROLL RESPONSE CRITERIA FOR TRANSPORT AIRCRAFT WITH ADVANCED FLIGHT CONTROL SYSTEMS IN THE LANDING APPROACH AND TOUCHDOWN
M. F. C. vanGool 26 Oct. 1980 134 p refs
(Contracts NIVR-1745; RB-RLD/78017; RB-RLD/78017/1; RB-RLD/79036)
(NLR-TR-80103-U) Avail: NTIS HC A07/MF A01

Approach and landing of an aircraft equipped with a roll-rate-command/bank-angle-hold flight control system were investigated, using a moving base simulator. Pilot comments and ratings following systematic variation of roll mode time constant, maximum available roll rate, and pure time delay were noted. Results indicate that roll response criteria are too lenient. The more precise control of bank angle, available with the flight control system, leads to a higher internal standard of the pilot for his judgement of roll response quality. These control systems must comply with more strict requirements than conventional systems to obtain the same degree of pilot approval. Based on the experiments, limits/boundaries in existing criteria are redefined and criteria are proposed. Author (ESA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

N82-25266*# Boeing Military Airplane Development, Wichita, Kans.
CONCEPTUAL DESIGN STUDY FOR AN ADVANCED CAB AND VISUAL SYSTEM, VOLUME 1 Final Report
R. J. Rue, M. L. Cyrus, T. A. Garnett, J. W. Nachbor, J. A. Seery, and R. L. Starr Jul. 1980 116 p refs Sponsored in part by the Dept. of the Army 2 Vol.
(Contract NAS2-10464)
(NASA-CR-166235; NAS 1.26:166235) Avail: NTIS HC A06/MF A01 CSCL 14B

A conceptual design study was conducted to define requirements for an advanced cab and visual system. The rotorcraft system integration simulator is for engineering studies in the area of mission associated vehicle handling qualities. Principally a technology survey and assessment of existing and proposed simulator visual display systems, image generation systems, modular cab designs, and simulator control station designs were performed and are discussed. State of the art survey data were used to synthesize a set of preliminary visual display system concepts of which five candidate display configurations were selected for further evaluation. Basic display concepts incorporated in these configurations included: real image projection, using either periscopes, fiber optic bundles, or scanned laser optics; and virtual imaging with helmet mounted displays. These display concepts were integrated in the study with a simulator cab concept employing a modular base for aircraft controls, crew seating, and instrumentation (or other) displays. A simple concept to induce vibration in the various modules was developed and is described. Results of evaluations and trade offs related to the candidate system concepts are given, along with a suggested weighting scheme for numerically comparing visual system performance characteristics. S.L.

N82-25267*# Boeing Military Airplane Development, Wichita, Kans.
CONCEPTUAL DESIGN STUDY FOR AN ADVANCED CAB AND VISUAL SYSTEM, VOLUME 2 Final Report
R. J. Rue, M. L. Cyrus, T. A. Garnett, J. W. Nachbor, J. A. Seery, and R. L. Starr Jul. 1980 171 p refs Sponsored in part by the Dept. of the Army 2 Vol.
(Contract NAS2-10464)
(NASA-CR-166236; NAS 1.26:166236) Avail: NTIS HC A08/MF A01 CSCL 14B

The performance, design, construction and testing requirements are defined for developing an advanced cab and visual system. The rotorcraft system integration simulator is composed of the advanced cab and visual system and the rotorcraft system motion generator, and is part of an existing simulation facility. User's applications for the simulator include rotorcraft design development, product improvement, threat assessment, and accident investigation. S.L.

N82-25268# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
A CONTAMINATION SIMULATION FACILITY WITH IN-SITU INFRARED ANALYSIS CAPABILITY
D. J. Carre, P. D. Fleischauer, H. R. Hedgpeth, W. J. Kalinowski, D. E. Masturzo, A. Pluchino, and M. A. Rocha 20 Jan. 1982 27 p refs
(Contract F04701-81-C-0082)
(AD-A111350; TR-0082(2945-03)-2; SD-TR-81-91) Avail: NTIS HC A03/MF A01 CSCL 07/4

A new volatile condensable materials (VCM) facility has been constructured. The facility features a unique in situ Fourier transform infrared spectophotometric system in addition to a quartz crystal microbalance and quadrupole mass spectrometer. Contaminants can be collected and subjected to infrared spectroscopy at the collection temperature, circumventing problems associated with ex situ infrared measurements. Preliminary results indicate that VCM, with deposition thicknesses less than 200 A, can be identified. GRA

N82-25269# Naval Air Engineering Center, Lakehurst, N.J. Test Dept.
PROCEDURE FOR CERTIFICATION TESTS OF CATAPULTS AND ASSOCIATED EQUIPMENT AFTER COMPLETION OF SERVICE LIFE EXTENSION PROGRAM ABOARD CV 59 CLASS VESSELS
Robert L. Schollenberger 19 Jan. 1982 104 p refs
(AD-A111530; NAEC-94-1141-Rev-A) Avail: NTIS HC A06/MF A01 CSCL 01/5

The procedures required for shipboard certification testing of catapults and associated equipment aboard CV 59 Class ships which have undergone the service life extension program are presented. The tests include: visual checks, static proof loads, hydrostatic tests, electrical and hydraulic system tests, steam accumulator tests, instrumentation requirements and deadload calibration. GRA

N82-25270# Air Force Human Resources Lab., Brooks AFB, Tex. Operations Training Div.
SIMULATOR FOR AIR-TO-AIR COMBAT VERSUS REAL WORLD: VISUAL CUE ANALYSIS FOR SIMULATED AIR-TO-AIR COMBAT TRAINING Final Report
Robert E. Coward and Alexander M. Rupp Jan. 1982 26 p refs
(AF Proj. 1123)
(AD-A110570; AFHRL-TR-81-26) Avail: NTIS HC A03/MF A01 CSCL 05/9

Flying an aircraft requires a continuous interpretation of the visual environment in which the pilot uses visual information from outside the cockpit and from the flight instruments inside

the cockpit to develop and maintain an awareness of the status of the aircraft and its location in space. Flying a high-speed/high-performance aircraft in an air-to-air combat environment vastly increases the complexity of the pilot's task. The pilot must also keep track of and evaluate the performance of any opposing aircraft. To maintain a dynamic awareness of the situation and ultimately to be successful in the airborne arena, the pilot depends heavily on interpretation of out-of-the-cockpit visual cues. Usually training of the necessary visual skills for air-to-air combat takes place entirely in the aircraft - a high stress environment where the student pilot quickly can become overwhelmed with visual information. In addition, the training is severely limited by both rules of engagement and aircraft safety limitations that prevent the student pilot from experiencing and practicing maximum performance tactics. GRA

N82-25197*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STATUS OF THE NATIONAL TRANSONIC FACILITY
Robert L. Swain *In its* Wind-Tunnel/Flight Correlation, 1981 Jun. 1982 p 1-21 (For primary document see N82-25196 16-02)
Avail: NTIS HC A10/MF A01 CSCL 14B

N82-26166# National Aeronautical Lab., Bangalore (India).
A SELF EXCITATION AND CONTROL SYSTEM FOR WIND TUNNEL DYNAMIC STABILITY MEASUREMENTS
R. V. Jategaonkar, R. Viswanathan, and N. A. Vasudeva Rao (Indian Telephone Industries) *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 37-44 refs (For primary document see N82-26161 16-99)
Avail: NTIS HC A08/MF A01

N82-26192# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
LASER VELOCIMETRY AT S3 MODANE WIND TUNNEL
A. Boutier *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1981-6, Nov.-Dec. 1981 (ESA-TT-741) Mar. 1982 p 67-71 refs Transl. by ONERA into ENGLISH from 'La Rech. Aerospatiale, Bull. Bimestriel (Paris) No. 1981-6, Nov.-Dec. 1981' (For primary document see N82-26185 16-99)
Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 55

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

N82-25271# Committee on Science and Technology (U. S. House).
THE FIRST A IN NASA
Washington GPO 1982 194 p Hearings before the Subcomm. on Transportation, Aviation and Mater. of the Comm. on Sci. and Technol., 97th Congr., 1st Sess., No. 61, 8 Dec. 1981 (GPO-89-476) Avail: Subcommittee on Transportation, Aviation and Materials

The contributions of NACA/NASA to both civil and military aviation are reviewed and the current relations of NASA with the aircraft industry and academia are examined in the light of proposed cuts in the aeronautics technology research portion of the agency's budget. The impact of the closing of the Lewis Research Center on the development of military aircraft is considered. A.R.H.

N82-25272*# Battelle Columbus Labs., Ohio.
PRELIMINARY RISK ASSESSMENT FOR NUCLEAR WASTE DISPOSAL IN SPACE, VOLUME 1 Executive Summary Report
Eric E. Rice, Richard S. Denning (Science Applications, Inc.), and Alan L. Friedlander 28 Feb. 1982 41 p refs 2 Vol. (Contract NAS8-34512)
(NASA-CR-162028; NAS 1.26:162028) Avail: NTIS HC A03/MF A01 CSCL 22A

The feasibility, desirability and preferred approaches for disposal of selected high-level nuclear wastes in space were analyzed. Preliminary space disposal risk estimates and estimates of risk uncertainty are provided. N.W.

N82-25273*# Battelle Columbus Labs., Ohio.
PRELIMINARY RISK ASSESSMENT FOR NUCLEAR WASTE DISPOSAL IN SPACE, VOLUME 2
Eric E. Rice, Richard S. Denning (Science Applications, Inc.), and Alan L. Friedlander 28 Feb. 1982 263 p refs 2 Vol. (Contract NAS8-34512)
(NASA-CR-162029; NAS 1.26:162029) Avail: NTIS HC A12/MF A01 CSCL 22A

Safety guidelines are presented. Waste form, waste processing and payload fabrication facilities, shipping casks and ground transport vehicles, payload primary container/core, radiation shield, reentry systems, launch site facilities, uprooted space shuttle launch vehicle, Earth packing orbits, orbit transfer systems, and space destination are discussed. Disposed concepts and risks are then discussed. N.W.

N82-26096# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
THE SCIENTIFIC OBJECTIVES OF THE GEOS MISSION
R. Grard and K. Knott *In* ESA The Solar System and its Exploration Nov. 1981 p 85-95 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

N82-26109# Graz Univ. (Austria). Research Center.
THE VENUS ORBITING IMAGING RADAR (VOIR) MISSION
Franz W. Leberl *In* ESA The Solar System and its Exploration Nov. 1981 p 189-197 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States AU, CN and NO (+20% others)

N82-26112# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
THE GIOTTO PROJECT: A FAST FLYBY OF HALLEY'S COMET
R. Reinhard *In* ESA The Solar System and its Exploration Nov. 1981 p 221-227 (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

N82-26113# Centre National de la Recherche Scientifique, Verrieres-le-Buisson (France). Lab. de Physique Stellaire et Planetaire.
INFRARED SOUNDING OF HALLEY'S COMET FROM THE FLYBY VENERA HALLEY PROBES
J. F. Crifo *In* ESA The Solar System and its Exploration Nov. 1981 p 229-244 refs (For primary document see N82-26087 16-88)
(Contract CNES-81-202)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

N82-26115# European Space Agency, Paris (France).
OUTLOOK ON FUTURE MISSIONS
G. P. Haskell *In its* The Solar System and its Exploration Nov. 1981 p 251-255 ref (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU CN and NO (+20% others)

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N82-25274*# Texas Univ., Austin. Dept. of Astronomy.
SATELLITE RANGING DATA ANALYSIS UNDER LAGEOS A. O. NO. OSTA 78-2 Final Report, 21 Nov. 1979 - 20 Aug. 1981

Peter J. Shelus Dec. 1981 33 p refs
(Contracts NAS5-25898; NAS5-25991)
(NASA-CR-166810; NAS 1.26:166810) Avail: NTIS HC A03/MF A01 CSCL 22A

LAGEOS and lunar laser ranging observations are combined to eliminate the shortcomings inherent in each technique, while accentuating the advantages of each. All three components of the Earth's rotation are produced with accuracy and precision which is compatible with observational uncertainties. S.L.

N82-25275# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ANALYTICAL EQUATIONS FOR ORBITAL TRANSFER MANEUVERS OF A VEHICLE USING CONSTANT LOW THRUST M.S. Thesis
Samuel J. Domino, Jr. Dec. 1981 45 p refs
(AD-A111142; AFIT/GA/AA/81D-3) Avail: NTIS HC A03/MF A01 CSCL 22/3

The object of this study is to derive a set of equations which predict the results of orbital maneuvers of vehicles using constant low thrust. These equations are developed by simplifying the problem to circular orbits in a two-body dynamic system. The results are presented in three parts. The first part solves for the equation of the coplanar radius change problem. The second finds the equation for the minimum fuel inclination change problem. The third part of this study puts the equations from the first two parts together to solve a minimum fuel transfer problem involving both radius and inclination changes. The solution of the minimum fuel transfer problem is not to perform the total radius change and then perform the total inclination change. Instead, the solution is to perform both radius and inclination changes on a per orbit basis. Author (GRA)

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N82-25276*# Sperry Flight Systems, Phoenix, Ariz.
PRELIMINARY DESIGN FOR A ZERO GRAVITY TEST FACILITY (ZGTF). VOLUME 1: TECHNICAL
Al Germain Nov. 1981 165 p
(Contract NAS5-26479)
(NASA-CR-166796-Vol-1; NAS 1.26:166796) Avail: NTIS HC A08/MF A01 CSCL 14B

The functional requirements and best conceptual design of a test facility that simulates weightless operating conditions for a high gain antenna systems (HGAS), that will broadcast to the Tracking Data Relay Satellites were defined. The typical HGAS defined is mounted on a low Earth orbiting satellite, and consists of an antenna with a double gimbal pointing system mounted on a 13 foot long mast. Typically, the gimbals are driven by pulse modulated dc motors or stepper motors. These drivers produce torques on the mast, with jitter that excites the satellite and may cause disturbances to sensitive experiments. The dynamic properties of the antenna support structure (mast), including flexible mode characteristics were defined. The torque profile induced on the spacecraft by motion of the high gain antenna was estimated. Gain and phase margins of the servo control loop of the gimbal drive electronics was also verified. S.L.

N82-25277*# Massachusetts Inst. of Tech., Cambridge. Space Systems Lab.
NUMBER AND PLACEMENT OF CONTROL SYSTEM COMPONENTS CONSIDERING POSSIBLE FAILURES
Craig R. Carignan and Wallace E. VanderVelde Mar. 1982 25 p ref
(Grant NAG1-126)
(NASA-CR-168988; NAS 1.26:168988) Avail: NTIS HC A02/MF A01 CSCL 22B

A decision making methodology is presented which is intended to be useful in the early stages of system design, before a control system is designed in detail. The methodology accounts for the likelihood of failure among the sensors and actuators in a control system. A method to compute the degree of controllability and degree of observability of a system for a given set of actuators and sensors is also presented. T.M.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N82-25278*# Boeing Aerospace Co., Seattle, Wash.
FUTURE ORBITAL TRANSFER VEHICLE TECHNOLOGY STUDY. VOLUME 1: EXECUTIVE SUMMARY Final Report
Eldon E. Davis Washington NASA May 1982 59 p refs
(Contract NAS1-16088)
(NASA-CR-3535-Vol-1; NAS 1.26:3535) Avail: NTIS HC A04/MF A01 CSCL 22B

Reusable space and ground based LO2/LH2 OTV's, both advanced space engines and aero assist capability were compared. The SB OTV provided advantages in life cycle cost, performance and potential for improvement. An all LO2/LH2 OTV fleet was also compared with a fleet of LO2/.H2 OTV's and electric OTV's. The normal growth technology electric OTV used silicon cells with heavy shielding and argon ion thrusters. In this case, the LO2/LH2 OTV fleet provided a 23% advantage in total transportation cost. An accelerated technology LF2/LH2 OTV provided improvements in performance relative to LO2/.H2 OTV but has higher DDT&E cost which negated its cost effectiveness. The accelerated technology electric vehicle used GaAs cells and annealing but still did not result in the mixed fleet being any cheaper than an all LO2/LH2 OTV fleet. It is concluded that reusable LO2/LH2 OTV's can serve all general purpose cargo roles between LEO and GEO for the forseeable future. The most significant technology for the second generation vehicle would be space debris protection, on orbit propellant storage and transfer and on orbit maintenance capability. A.R.H.

N82-25279*# National Aeronautics and Space Administration, Washington, D. C.
WESTAR-V LAUNCH ON DELTA
[1982] 24 p
(NASA-TM-84750; O-492-203-82-05; NAS 1.15:84750) Avail: NTIS HC A02/MF A01 CSCL 22A

The WESTAR-V, the second in a series of second-generation, large, 24-transponder communications satellites developed for the Space Communications Company is discussed. It is scheduled to be launched on a Delta vehicle from the Eastern Space and Missile Center no earlier than June 8, 1982. The launch support for this mission will be provided by NASA, on a reimbursable basis, to the Space Communications Company for a fixed price of $25.0M. The launch vehicle for the WESTAR-V mission will be the Delta 3910 configuration which incorporates an extended long tank Thor booster, nine Castor IV strap-on motors, a TR-201 second stage, and an 8-foot fairing. The Delta launch vehicle will place the spacecraft along a suborbital trajectory. The PAM-D stage will then thrust it to a synchronous transfer orbit. Three days after launch, the spacecraft apogee kick motor will be fired to circularize its orbit at geosynchronous altitude of 19,300 NM above the equator at approxmately 75 degrees west longitude. R.J.F.

N82-25280# Pacific Missile Test Center, Point Mugu, Calif.
STRUCTURAL CONSIDERATIONS FOR THE RECOVERY OF AIR-TO-AIR MISSILES
Arvid A. Anderson 14 May 1981 17 p refs Sponsored by AF
(AD-A111796) Avail: NTIS HC A02/MF A01 CSCL 16/4

The recovery of air-to-air missiles for training and evaluation is a cost and asset saving technique for consideration of the missile community. Cost, environmental, logistic, and physical

constraints require decisions that complicate the structural designers task. Some considerations for design are discussed. An example showing possible trade-offs is given. A discussion of structural considerations is then followed by concluding statements. Author (GRA)

N82-25281# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

CLOSED-LOOP CONTROL OF A SATELLITE IN AN UNSTABLE PERIODIC ORBIT ABOUT L3 M.S. Thesis

Felicia C. Vass Dec. 1981 110 p refs

(AD-A111147; AFIT/GA/AA/81D-11) Avail: NTIS HC A06/MF A01 CSCL 22/3

A stable Luenberger Observer was developed to reconstruct the error states in modal coordinates for a satellite in a periodic orbit about the Earth-Moon Lagrangian point, L3. Observer pole placement for the third root was found to be linear with applied gain. Convergence of the observer estimate to the true state vector was rapid in all cases, but depended upon the initial conditions considered. The addition of the observer did not impede the long-term behavior of the controller in stabilizing the orbit. Author (GRA)

N82-25282# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

ESTIMATION OF LAUNCH VEHICLE PERFORMANCE PARAMETERS FROM AN ORBITING SENSOR M.S. Thesis

Gregory D. Miller Dec. 1981 75 p refs

(AD-A111145; AFIT/GA/AA/81D-9) Avail: NTIS HC A04/MF A01 CSCL 12/1

A seven-state inverse covariance (Bayes) filter was implemented to determine performance parameters of a launch vehicle. Data measurements were restricted to azimuth and elevation readings, typical of data from an infrared sensor in geosynchronous orbit. Results of this study indicate that the magnitude of constant acceleration, assumed to act in the direction of velocity, can be estimated using a seven-state filter (3 states each for position and velocity, and a seventh state for acceleration). The system is unobservable for short arcs if only one observer is available. The addition of a second observer can allow the system to be observed. An ad hoc fading - memory technique, in which confidence in the seventh state estimate was decreased, proved unsuccessful in estimating variable acceleration of a launch vehicle. Further attempts at estimating variable acceleration with an eight-state filter (3 states each for position and velocity, and seventh and eighth states involving engine exit velocity and propellant mass flow rate) were unsuccessful. GRA

N82-25283# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.

ASPECT DEPENDENCE AND FREQUENCY SPECTRUM OF ELECTRICAL DISCHARGES ON THE P78-2(SCATHA) SATELLITE

Harry C. Koons 15 Jan. 1982 30 p refs

(Contract F04701-81-C-0082)

(AD-A111327; TR-0082(2940-06)-3; SD-TR-81-39) Avail: NTIS HC A03/MF A01 CSCL 20/3

The SCATHA (P78-2) satellite payload includes a Charging Electrical Effects Analyzer to measure the characteristics of electrical discharges that occur on the vehicle due to spacecraft charging. During 233 days of operation, 19 pulses on 10 different days have been related to electrical discharges. Five of these discharges took place when the pulse analyzer was in a mode with sufficient time resolution to resolve the frequency components in the waveform. The dominant frequencies ranged from 5 to 32 MHz with amplitudes from 0.4 to 0.9 V into a 50-ohm load. Author (GRA)

N82-25284# Naval Postgraduate School, Monterey, Calif. Dept. of Administrative Sciences.

A MODEL OF THE DOMESTIC COMMERCIAL SATELLITE INDUSTRY: A DIFFERENT PERSPECTIVE M.S. Thesis

Pamela M. Mulvehill Mar. 1981 156 p refs

(AD-A111050) Avail: NTIS HC A08/MF A01 CSCL 05/3

The domestic satellite (DOMSAT) industry has progressed through many stages of development in its short history. These stages of development are based on the areas of influence that deeply affect the direction of the industry. Based on the author's model of industry structure, conduct and performance, a model of the telecommunications industry past and present is developed. The stages of the telecommunications industry are based on the premise that various external environmental factors played a key role in influencing the industry as it progressed over time. Satellite communications technology has its base in the telecommunications industry and thus follow a similar pattern of development through four major stages of growth that impact the DOMSAT industry structure, conduct and performance. Author (GRA)

N82-25285# Atomic Energy Control Board, Ottawa (Ontario).

COSMOS 954. THE OCCURRENCE AND NATURE OF RECOVERED DEBRIS

W. K. Gummer, F. R. Campbell, G. B. Knight, and J. I. Richard May 1980 60 p refs

(INFO-0006; CC-172-2/1980E; ISBN-0-660-10589-6) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

The presence of radioactive debris from the nuclear powered satellite was quickly verified on the frozen surfaces of lakes and land. A massive airborne and ground search and recovery program lasted from reentry date to the middle of October, 1978, interrupted only by the spring break-up period. The search area extended from Great Slave Lake northeastward towards Baker Lake. Only about 65 kilograms of material were found. All fragments but one, itself weighing over 18 kg - were radioactive; many showed clear evidence of melting and erosion. A wide area was affected by a scattered shower of minute particles representing the enriched fuel of the satellite's power source. Laboratory studies were carried out on particles to learn their chemical and physical nature. Search and recovery continued until it could be concluded that (1) it was most unlikely that highly radioactive fragments had been missed; (2) all obvious large fragments had been located and removed; (3) the risk to people from particles remaining in unfrequented areas was not great because of the particles' tiny size, their general insolubility, and their scattered distribution. Residual radiological risks were also fading rapidly relative to the natural radiation background. DOE

N82-25286# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Raumfahrt.

THE DEVELOPMENT OF GEOSTATIONARY COMMUNICATION SATELLITES

Dietrich E. Koelle 13 Jul. 1981 10 p refs Repr. from Rundfunktech. Mitt. Jahrgang 25, no. 5, 1981 p 219-226 In GERMAN; ENGLISH summary Presented at Kongr. Kommunikation ueber Satelliten des Muenchner Kreis, Munich, 23-24 Oct. 1980

(MBB-UR-530-81-O) Avail: NTIS HC A02/MF A01

The development of communication satellites is surveyed. Major satellite systems are described. Their data handling characteristics are mentioned and physical parameters are given. With increasing demand for communication services via satellites and limited orbital positions in geosynchronous orbit, there is a trend to larger communication satellite platforms (3000 kg mass or more). An advanced U.S. platform concept (approximately 10,000 kg satellite mass) and the European Geoplatform are shown as examples of future systems. Author (ESA)

N82-26163# Indian Space Research Organization, Trivandrum. Aerodynamics Div.

COUPLED LIBRATIONAL CONTROL OF SATELLITE USING SIMPLIFIED SOLAR CONTROLLER WITH SPRING-MASS DAMPER

Rajeev Lochan and K. Kumar (Indian Inst. of Technology, Kanpur) *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1982 p 7-16 refs (For primary document see N82-26161 16-99)

Avail: NTIS HC A08/MF A01

N82-26168# Indian Space Research Organization, Trivandrum.

EFFECT OF RAREFIED DRAG ON LIFE TIME ESTIMATION OF SATELLITES

K. K. Biswas *In* Indian Inst. of Science The J. of Aeron. Soc. of India, Vol. 32 No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 51-54

refs (For primary document see N82-26161 16-99)
Avail: NTIS HC A08/MF A01

N82-26170# Indian Space Research Organization, Trivandrum. Mission Analysis Group, Project SLV.
ANALYTICAL STUDY OF SPINNING SOLID UPPER STAGE DYNAMICS
K. A. P. Menon and N. Sundararajan *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 65-76 refs (For primary document see N82-26161 16-99)
Avail: NTIS HC A08/MF A01

N82-26180# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.
ATTITUDE ACQUISITION USING MOMENTUM TRANSFER AND REACTIONS JETS
Shashi Kant Shrivastava and Shrihari Roy *In its* The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 129-131 refs (For primary document see N82-26161 16-99)
Avail: NTIS HC A08/MF A01

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N82-25287* National Aeronautics and Space Administration, Washington, D. C.
COLUMBIA UNDERGOES FINAL SHAKEDOWN DURING SEVEN-DAY STS-4 MISSION
7 Jun. 1982 94 p refs
(NASA-News-Release-82-84; P82-10086) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, Baltimore/Washington International Airport, Md. 21240 CSCL 22A

The launch preparations for the Space Transportation System 4 flight of the space shuttle Columbia are described. The details of the spacecraft's mission profile are given. Several experiments and payloads are described. An account of the remote manipulator system is given. Studies of long-term thermal extremes on the orbiter subsystems and a survey of orbiter induced contamination of the payload bay are identified as mission priorities. R.J.F.

N82-25288# Committee on Science and Technology (U. S. House).
FLIGHT OF STS-2 WITH ASTRONAUTS COLONEL JOE ENGLE AND CAPTAIN RICHARD TRULY
Washington GPO 1982 32 p Hearing before the Comm. on Sci. and Technol., 97th Congr., 1st Sess., No. 70, 9 Dec. 1981 (GPO-89-541) Avail: Committee on Science and Technology

The Space Transportation System 2 flight is described by the astronauts who piloted the shuttle vehicle. Personal impressions and scientific explanations of various aspects of the flight are given. Weightlessness, thunderstorms, terrain, and space flight stress are discussed. R.J.F.

N82-25289# Naval Surface Weapons Center, White Oak, Md.
THE BEHAVIOR OF RANGE SAFETY SYSTEM ORDNANCE FOR THE SPACE SHUTTLE WITH SIMULATED AERODYNAMIC HEATING Final Report, 2 Apr. 1979 - 2 Apr. 1980
N. L. Coleburn and E. Zimet 20 Oct. 1981 36 p refs
(AD-A110531; NSWC/TR-81-175) Avail: NTIS HC A03/MF A01

Autoignition and performance tests simulating reentry temperature conditions were completed using the RSS ordnance in a simulated flight configuration. Temperature measurements were made at several locations within the RSS to provide data for thermal model correlation. Autoignition resulted in detonation and functioning of the RSS with destruction (cutting) of the simulated External Tank wall in five tests. In six tests, thermal explosions resulted with no cutting action. Autoignition of HMX in the linear shaped charge configuration occurred at approx. 470 F compared to the reported value of 585 F for the bulk explosive. Autoignition of the complete RSS (CDF-LSC assembly) occurred in the range of 390 - 450 F. It appears that autoignition of the PETN tip at the end of the CDF is not a factor in the transfer of explosion or detonation to the linear shaped charge, and HNS in the CDF is safe to approx. 1000 deg F. Author (GRA)

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N82-25290*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SATELLITE-AIDED LAND MOBILE COMMUNICATIONS SYSTEM IMPLEMENTATION CONSIDERATIONS
Bruce E. LeRoy 1982 10 p refs Presented at the Intern. Commun. Conf., Philadelphia, 16-19 Jun. 1982
(NASA-TM-82861; E-1229; NAS 1.15:82861) Avail: NTIS HC A02/MF A01 CSCL 09F

It was proposed that a satellite-based land mobile radio system could effectively extend the terrestrial cellular mobile system into rural and remote areas. The market, technical and economic feasibility for such a system is studied. Some of the aspects of implementing an operational mobile-satellite system are discussed. In particular, two key factors in implementation are examined: (1) bandwidth requirements; and (2) frequency sharing. Bandwidth requirements are derived based on the satellite antenna requirements, modulation characteristics and numbers of subscribers. Design trade-offs for the satellite system and potential implementation scenarios are identified. Frequency sharing is examined from a power flux density and modulation viewpoint. B.W.

N82-26089# Centre National d'Etudes Spatiales, Toulouse (France). Div. Analyse de Missions-Prospective.
MISSION TECHNIQUES AND ORBITAL MECHANICS FOR INTERPLANETARY SPACECRAFT
Alain Perret *In* ESA The Solar System and its Exploration Nov. 1981 p 13-22 (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N82-25291*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TWELFTH SPACE SIMULATION CONFERENCE: SHUTTLE PLUS ONE. A NEW VIEW OF SPACE
Russell Thomas Hollingsworth, ed. 1982 339 p refs Conf. held in Pasadena, Calif., 17-19 May 1982; sponsored by JPL, IES, AIAA and the Am. Soc. for Testing and Mater.
(NASA-CP-2229; NAS 1.55:2229; Rept-82B0455) Avail: NTIS HC A15/MF A01 CSCL 22B

The proceedings address the state-of-the-art in space simulation test technology, thermal simulation and protection, contamination, remote sensing, and dynamics testing and

assessment. For individual titles, see N82-25292 through N82-25311.

N82-25292*# European Space Research and Technology Center, Noordwijk (Netherlands).

SPACECRAFT THERMAL BALANCE TESTING USING INFRARED SOURCES

G. B. T. Tan and J. B. Walker *In* NASA. Goddard Space Flight Center 12th Space Simulation Conf. 1982 26 p refs (For primary document see N82-25291 16-18)

Avail: NTIS HC A15/MF A01 CSCL 22B

A thermal balance test (controlled flux intensity) on a simple black dummy spacecraft using IR lamps was performed and evaluated, the latter being aimed specifically at thermal mathematical model (TMM) verification. For reference purposes the model was also subjected to a solar simulation test (SST). The results show that the temperature distributions measured during IR testing for two different model attitudes under steady state conditions are reproducible with a TMM. The TMM test data correlation is not as accurate for IRT as for SST. Using the standard deviation of the temperature difference distribution (analysis minus test) the SST data correlation is better by a factor of 1.8 to 2.5. The lower figure applies to the measured and the higher to the computer-generated IR flux intensity distribution. Techniques of lamp power control are presented. A continuing work program is described which is aimed at quantifying the differences between solar simulation and infrared techniques for a model representing the thermal radiating surfaces of a large communications spacecraft. M.G.

N82-25293*# Perkin-Elmer Corp., Danbury, Conn. Optical Technology Div.

IMPROVED MULTILAYER INSULATION APPLICATIONS

George Mikk *In* NASA. Goddard Space Flight Center 12th Space Simulation Conf. 1982 8 p refs (For primary document see N82-25291 16-18)

Avail: NTIS HC A15/MF A01 CSCL 22B

Multilayer insulation blankets used for the attenuation of radiant heat transfer in spacecraft are addressed. Typically, blanket effectiveness is degraded by heat leaks in the joints between adjacent blankets and by heat leaks caused by the blanket fastener system. An approach to blanket design based upon modular sub-blankets with distributed seams and upon an associated fastener system that practically eliminates the through-the-blanket conductive path is described. Test results are discussed providing confirmation of the approach. The specific case of the thermal control system for the optical assembly of the Space Telescope is examined. M.G.

N82-25294*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

TRANSIT THERMAL CONTROL DESIGN FOR GALILEO ENTRY PROBE FOR PLANET JUPITER

George C. Haverly (GE Co.) and William Pitts *In* NASA. Goddard Space Flight Center 12th Space Simulation Conf. 1982 17 p (For primary document see N82-25291 16-18)

Avail: NTIS HC A15/MF A01 CSCL 22B

A totally passive design was completed for the thermal control of the Galileo entry probe during its transit to the planet Jupiter. The design utilizes radio isotope heater units, multilayer insulation blankets and a thermal radiator in conjunction with a design conductance support structure to achieve both the required storage and critical initial planet atmosphere entry temperatures. The probe transit thermal design was completed and verified based on thermal vacuum testing of a prototype probe thermal test model. M.G.

N82-25295*# Martin Marietta Corp., Denver, Colo.

A SURVEY OF METHODS FOR MEASURING THERMALLY INDUCED DISTORTIONS OF TEST ARTICLES UNDERGOING SOLAR THERMAL VACUUM TEST

R. D. Rempt *In* NASA. Goddard Space Flight Center 12th Space Simulation Conf. 1982 8 p (For primary document see N82-25291 16-18)

Avail: NTIS HC A15/MF A01 CSCL 22B

Various methods of measuring the small thermally induced distortions experienced either by various points on the space vehicles or by deviations of surfaces from a known shape during solar thermal vacuum tests are examined. State-of-the-art application of both photographic and real time observation are discussed. The relative merits of each of the methods are compared and evaluated in their applications to different types of test articles and situations. Magnitudes of thermally induced distortions which may be expected to be routinely measurable by the various methods are presented and compared. M.G.

N82-25296*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

OPTICAL CHARACTERIZATION OF SOLAR CONCENTRATOR MIRRORS USING THE SOLAR BEAM OF THE JPL 25-FOOT SPACE SIMULATOR

Maurice J. Argoud and Edwin W. Dennison *In* NASA. Goddard Space Flight Center 12th Space Simulation Conf. 1982 19 p (For primary document see N82-25291 16-18)

Avail: NTIS HC A15/MF A01 CSCL 22B

The Jet Propulsion Laboratory 25-foot space simulator with its 5.8-m (19-ft) diameter simulated solar beam provides an excellent facility for measuring the optical characteristics of parabolic solar concentrator panels and gores. The virtual source position and size were determined by using a single lamp of the 37 xenon 30-kW source array with only the center lens in the 19-channel optical mixer. This data was used to define the optical test geometry, and it allowed accurate measurement of focal length and surface deviations of the mirror under test. A flux distribution of a typical solar concentrator placed directly on the solar beam gives measurements of performance at the focal point of the parabolic surface. Author

N82-25297*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.

CRYOPUMP FOR LARGE PULSES OF HYDROGEN

B. C. Moore, R. G. Camarillo, and J. T. Morrow *In* NASA. Goddard Space Flight Center 12th Space Simulation Conf. 1982 23 p refs Sponsored in part by the Army Ballistic Missile Defense System Command (For primary document see N82-25291 16-18)

Avail: NTIS HC A15/MF A01 CSCL 22B

A test involving a flow of hot hydrazine decomposition products at a rate of 13.6 g/s (0.03 lb/s) established the requirement to maintain pressure in an 11.9-m-(39 ft) diameter space chamber below 200 microns. The flow, 2/3 hydrogen and 1/3 nitrogen by volume, continued for several periods ranging from 3 to 15 min. The pressure requirement was necessary to minimize thermal effects of the gas on the test vehicle but was well beyond the capability of the existing facility pumps. Various methods of obtaining additional temporary jump capacity were considered. From these, the slugged-charcoal approach was selected as the quickest and least expensive method to implement. R.J.F.

N82-25298*# Martin Marietta Corp., Denver, Colo.

EDUCATION AND TRAINING OF PERSONNEL IN SPACE SIMULATION

R. D. Rempt *In* NASA. Goddard Space Flight Center 12th Space Simulation Conf. 1982 5 p (For primary document see N82-25291 16-18)

Avail: NTIS HC A15/MF A01 CSCL 22B

The training program and procedures developed and implemented at the space simulation laboratory at Martin Marietta Aerospace in Denver are discussed. The training of technicians and professionals as well as preparation for instructors is covered. Training manuals and their compilation are reported as applicable to the specific needs of the laboratory. The development of a space simulation course as part of the Martin Marietta Continuing Education Night School approaching space simulation from an academic viewpoint is presented. Finally, public relations tours of the facility as an informational/educational tool are discussed. R.J.F.

N82-25299*# General Electric Co., Falls Church, Va. Ground Segment Integration and Test Group.

A REAL-TIME DYNAMIC SPACECRAFT SIMULATOR FOR THE LANDSAT-D MISSION

Allen R. Coffin *In* NASA. Goddard Space Flight Center 12th Space Simulation Conf. 1982 17 p ref (For primary document see N82-25291 16-18)

(Contract NAS5-2300)
Avail: NTIS HC A15/MF A01 CSCL 22B

A real time dynamic simulator for LANDSAT D was developed and has played an integral role in the development and validation of both the ground control system and of the on-board flight software. The simulator utilized an electronic replica of the spacecraft on-board computer and data handling hardware interfaced to a VAX 11/780 computer and simulation software. Key features of the simulator design are a modular software architecture tailored to the VAX/VMS real time capabilities, a microprocessor controlled interface between the VAX and the flight hardware replica, complete simulation of the spacecraft and NASA network communication links, and a flexible and powerful scenario structuring and operator control capability. The design goals and trade-offs, software, and hardware design are summarized. The application of the simulator to the validation of both the ground systems and on-board software is reviewed in detail. R.J.F.

N82-25300*# European Space Research and Technology Center, Noordwijk (Netherlands).
ENVIRONMENTAL TEST FACILITIES USED IN EUROPE FOR ESA SATELLITE PROGRAMMES
Peter W. Brinkmann *In* NASA. Goddard Space Flight Center 12th Space Simulation Conf. 1982 28 p refs (For primary document see N82-25291 16-18)
Avail: NTIS HC A15/MF A01 CSCL 22B

The structure of the European Space Agency (ESA) is described. The major test facilities used for ESA programs are described. Facility characteristics and special test methods are described. R.J.F.

N82-25301*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DYNAMIC ENVIRONMENTS FOR SPACE SHUTTLE PAYLOADS
Dennis L. Kern and Michael R. OConnell *In* NASA. Goddard Space Flight Center 12th Space Simulation Conf. 1982 18 p refs (For primary document see N82-25291 16-18)
(Contract NAS7-100)
Avail: NTIS HC A15/MF A01 CSCL 22B

Payload bay dynamic data from the first two space shuttle flights are summarized and evaluated. Development of dynamic environment design and test criteria for shuttle payloads from measured flight data is discussed. Factors that must be considered are flight to flight variations, spatial variations, temporal variations, measurement bias errors and the degree of confidence desired that a predicted environment will not be exceeded in flight. Summary and conclusion reports will be published after STS-4 and at appropriate intervals thereafter. The nature of these future reports and their impact on the user community is discussed. R.J.F.

N82-25302*# Texas Univ., Dallas. Graduate Program in Environmental Sciences.
ENVIRONMENTAL NOISE ASSESSMENT STS-1 COLUMBIA LAUNCH
George J. Putnicki *In* NASA. Goddard Space Flight Center 12th Space Simulation Conf. 1982 16 p refs (For primary document see N82-25291 16-18)
Avail: NTIS HC A15/MF A01 CSCL 22B

An environmental noise assessement of the initial launch of the Space Transportation System, STS-1 Columbia was conducted. The principal objective of the environmental noise assessment was to measure the noise generated during the initial launch of the space shuttle to ascertain the validity of the levels predicted in the 1979 environmental impact statement. In the 1979 study information obtained for expendable launch vehicles, Titan, Saturn and Atlas was used to predict the noise levels that would be generated by the simultaneous firing of the two solid rocket boosters and the three space shuttle main engines. Fifteen monitoring sites were established in accessable areas located from 4,953 to 23,640 meters from the launch pad. Precision sound level meters were used to capture the peak level during the launch. Data obtained was compared to the predicted levels and were also compared to the identified levels, standards and criteria established by the federal agencies with noise abatement and control responsibilities. R.J.F.

N82-25303*# Dayton Univ., Ohio. Research Inst.
OUTGASSING: ITS EFFECTS ON SPACECRAFT. VIBRATION DAMPING MATERIALS
Michael L. Drake, Matthew F. Kluesener, and William R. Goddard *In* NASA. Goddard Space Flight Center 12th Space Simulation Conf. 1982 25 p refs Sponsored in part by International Telecommunication Satellite Organization (For primary document see N82-25291 16-18)
Avail: NTIS HC A15/MF A01 CSCL 22B

The correlation of outgassing to the stability of the damping properties of polymer materials to be used in spacecraft structures is discussed. A test series was devised to obtain basic information from off-the-shelf damping materials. The test results could be considered as a guideline toward the application of these materials. Eight materials were selected to form a representative cross section of those polymers having both ready availability as commercial damping materials and desirable properties. A table indicates the temperatures at which peak damping occurs at 1 Hz and the type of beam specimen used in the vacuum exposure tests. These materials as a group cover the temperature range of -85 C to 38 C. R.J.F.

N82-25304*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DESIGN AND DEVELOPMENT OF THE ERBE DATA MANAGEMENT SYSTEM
James F. Kibler *In* NASA. Goddard Space Flight Center 12th Space Simulation Conf. 1982 15 p refs (For primary document see N82-25291 16-18)
Avail: NTIS HC A15/MF A01 CSCL 22B

The Earth radiation budget experiment (ERBE) software development approach is described. An iterative development approach was adopted which provides for three releases or versions of the processing system, each of increasing levels of complexity and solidity. The final release of the system will be used to process the flight data. The major phases for each iterative release consist of specifications developed in concert with the science team, preliminary design, subsystem reviews, coding, subsystem code walkthroughs, system testing, system documentation, and project status review. B.W.

N82-25305*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
REMOTE SENSING OF TORNADIC STORMS FROM SPACE
R. J. Hung (Alabama Univ., Huntsville) and R. E. Smith *In* NASA. Goddard Space Flight Center 12th Space Simulation Conf. 1982 11 p refs (For primary document see N82-25291 16-18)
Avail: NTIS HC A15/MF A01 CSCL 22B

By using infrared images obtained from GOES satellite, the digital count values of pixels representing blackbody temperatures of the cloud top, convective storms are observed throughout their life cycles. Clouds associated with a tornadic storm are compared with those without a tornadic storm to illustrate how the infrared and visible observations from a geosynchronous satellite can be used to study the differences in their life cycles. B.W.

N82-25306*# Iowa Univ., Iowa City.
MEASUREMENTS BY THE PLASMA DIAGNOSTICS PACKAGE ON STS-3
Stanley D. Shawhan and Gerald B. Murphy *In* NASA. Goddard Space Flight Center 12th Space Simulation Conf. 1982 8 p refs (For primary document see N82-25291 16-18)
Avail: NTIS HC A15/MF A01 CSCL 22B

A comprehensive set of measurements about the orbiter environment are provided by the plasma diagnostics package (PDP). Ion and electron particle densities, energies, and spatial distribution functions; ion mass for identification of particular molecular ion species; and magnetic fields, electric fields and electromagnetic waves over a broad frequency range are studied. Shuttle environmental measurements will be made both on the pallet and, by use of the remote manipulator system (RMS), the PDP will be maneuvered in and external to the bay area to continue environmental measurements and to carry on a joint plasma experiment with the Utah State University fast-pulsed electron generator. Results of orbiter environment EMI measure-

ments and S-band field strengths as well as preliminary results from wake search operations indicating wake boundary identifiers are reported. B.W.

N82-25307*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACE SHUTTLE PRELIMINARY. CONTAMINATION ASSESSMENT FROM STS-1 AND STS-2
L. J. Leger, H. K. F. Ehlers, S. Jacobs, and E. Miller (NASA. Marshall Space Flight Center) *In* NASA. Goddard Space Flight Center 12th Space Simulation Conf. 1982 21 p refs (For primary document see N82-25291 16-18)
Avail: NTIS HC A15/MF A01 CSCL 22B

A preliminary assessment of the space shuttle contamination environment was made using data from the first two orbital flight tests, STS-1 and STS-2. Data sources consisted of crew observations during flight, postflight vehicle inspection, and the induced environment contamination monitor which was used on STS-2 and consists of 10 instruments. These instruments are used to measure gas phase contaminants, particle population, humidity, and molecular deposition in the orbiter payload bay during ascent and descent and particle population, molecular deposition, and gas cloud during orbital flight. Results of the measurements described are presented in summary form and indicate low molecular deposition rates for both pressurized and orbital flight. Author

N82-25308*# Aerospace Corp., Los Angeles, Calif.
A FACILITY FOR THE SIMULATION OF LOW ORBIT ATMOSPHERIC OXYGEN BOMBARDMENT
G. S. Arnold, R. R. Herm, and D. R. Peplinski *In* NASA. Goddard Space Flight Center 12th Space Simulation Conf. 1982 1 p (For primary document see N82-25291 16-18)
Avail: NTIS HC A15/MF A01 CSCL 22B

A molecular beam facility to simulate the space environment of a spacecraft at low orbit was designed with the intent of studying the effect on the properties of optical elements of oxygen atoms impacting at orbital velocity. The four-stage differentially pumped molecular beam facility includes a variety of oxygen atom beam sources which cover a wide range of velocities (1 km/sec to approximately > 8 km/sec), in addition to the ultra-clean experimental environmental of an ultra-high vacuum chamber and an optical diagnostic set-up. The primary oxygen atom beam source used to obtain the 8 km/sec O atoms is an arc heated source. It consists of a modified commercially available plasma torch. The modifications include attachments which provide for a nozzle which is used to expand the atomic beam into the vacuum system, and exhaust channels to dispose of excess torch gas. The torch operates in the 'nontransferred' mode of operation, that is the electric arc is confined within the torch. A plasma is formed in helium by a dc arc. A small amount of O2 is injected downstream from the arc where it is thermally dissociated by the hot He into oxygen atoms. The high temperature and isentropic expansion give the oxygen atoms their velocity. Using seeded beam techniques, oxygen atom beams of approximately 3.5 and approximately 1.5 km/sec, respectively, are obtained. B.W.

N82-25309*# Perkin-Elmer Corp., Danbury, Conn. Optical Technology Div.
AUTOMATING A RESIDUAL GAS ANALYZER
Ward F. Petrie and Alvin H. Westfall *In* NASA. Goddard Space Flight Center 12th Space Simulation Conf. 1982 16 p ref (For primary document see N82-25291 16-18)
Avail: NTIS HC A15/MF A01 CSCL 22B

A residual gas analyzer (RGA), a device for measuring the amounts and species of various gases present in a vacuum system is discussed. In a recent update of the RGA, it was shown that the use of microprocessors could revolutionize data acquisition and data reduction. This revolution is exemplified by the Inficon 1Q200 RGA which was selected to meet the needs of this update. The Inficon RGA and the Zilog microcomputer were interfaced in order the receive and format the digital data from the RGA. This automated approach is discussed in detail. B.W.

N82-25310*# Martin Marietta Aerospace, Denver, Colo.
CONTAMINANT CHARACTERIZATION OF FIVE SATELLITE MATERIALS
J. A. Muscari *In* NASA. Goddard Space Flight Center 12th Space Simulation Conf. 1982 16 p refs (For primary document see N82-25291 16-18)
(Contract F33615-78-C-5168)
Avail: NTIS HC A15/MF A01 CSCL 22B

An extensive laboratory test program was performed to characterize outgassing of five satellite materials. The materials were Chemglaze Z-306 over 9922 primer, M-773 adhesive, multilayer insulation, polyurethane foam, and silverized Teflon. The souces were prepared to the specifications of a typical satellite program. Dynamic thermogravimetric mass loss characteristics of these five materials were obtained in vacuum with a beam microbalance. The temperature of the material was linearly raised from 25 C to over 650 C while monitoring the mass loss, rate of mass loss, temperature, and the composition of the outgassed material by residual gas analysis. Isothermal source emission/capture coefficients/reemission parameters were obtained with an array of quartz crystal microbalances (QCM). A detailed test matrix in which the temperatures of the QCMs (-160 C, - 100 C, -40 C, and +10 C) and the source material (125 C, and 90 C, and 50 C) were varied was performed. The array of QCMs was also used to measure the spatial distribution of the source emission. The effects of vacuum ultraviolet radiation on the deposition and reemission parameters was determined. Author

N82-25311*# Boeing Aerospace Co., Seattle, Wash.
IUS MATERIALS OUTGASSING CONDENSATION EFFECTS ON SENSITIVE SPACECRAFT SURFACES
C. R. Mullen, C. G. Shaw, and E. R. Crutcher *In* NASA. Goddard Space Flight Center 12th Space Simulation Conf. 1982 22 p (For primary document see N82-25291 16-18)
(Contract F04701-78-C-0053)
Avail: NTIS HC A15/MF A01 CSCL 22B

Four materials used on the inertial upper state (IUS) were subjected to vacuum conditions and heated to near-operational temperatures (93 to 316 C), releasing volatile materials. A fraction of the volatile materials were collected on 25 C solar cells, optical solar reflectors (OSR's) or aluminized Mylar. The contaminated surfaces were exposed to 26 equivalent sun hours of simulated solar ultraviolet (UV) radiation. Measurements of contamination deposit mass, structure, reflectance and effects on solar cell power output were made before and after UV irradiation. Standard total mass loss - volatile condensible materials (TML - VCM) tests were also performed. A 2500 A thick contaminant layer produced by EPDM rubber motor-case insulation outgassing increased the solar absorptance of the OSR's from 0.07 to 0.14, and to 0.18 after UV exposure. An 83,000 A layer caused an increase from 0.07 to 0.21, and then the 0.46 after UV exposure. The Kevlar-epoxy motor-case material outgassing condensation raised the absorptance from 0.07 to 0.13, but UV had no effect. Outgassing from multilayer insulation and carbon-carbon nozzle materials did not affect the solar absorptance of the OSR's. Author

N82-25312*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
OXYGEN ATOM REACTION WITH SHUTTLE MATERIALS AT ORBITAL ALTITUDES
Lubert J. Leger May 1982 26 p refs
(NASA-TM-58246; S-516; NAS 1.15:58246) Avail: NTIS HC A03/MF A01 CSCL 22B

Surfaces of materials used in the space shuttle orbiter payload bay and exposed during STS-1 through STS-3 were examined after flight. Paints and polymers, in particular Kapton used on the television camera thermal blanket, showed significant change. Generally, the change was a loss of surface gloss on the polymer with apparent aging on the paint surfaces. The Kapton surfaces showed the greatest change, and postflight analyses showed mass loss of 4.8 percent on STS-2 and 35 percent on STS-3 for most heavily affected surfaces. Strong shadow patterns were evident. The greatest mass loss was measured on surfaces which were exposed to solar radiation in conjunction with exposure in the vehicle velocity vector. A mechanism which involves the interaction of atomic oxygen with organic polymer surfaces is proposed. Atomic oxygen is the major ambient species at low orbital altitudes and presents a flux of 8 x 10 to the 14th power atoms/cu cm sec for reaction. Correlation of the expected mass loss based on ground-based oxygen atom/polymer

reaction rates shows lower mass loss of the Kapton than measured. Consideration of solar heating effects on reaction rates as well as the high oxygen atom energy due to the orbiter's orbital velocity brings the predicted and measured mass loss in surprisingly good agreement. Flight sample surface morphology comparison with ground based Kapton/oxygen atom exposures provides additional support for the oxygen interaction mechanism. M.G.

N82-25313# Oklahoma State Univ., Stillwater. Dept. of Physics.

CHARACTERIZATION OF THE OPTICAL PROPERTIES OF LASER AND PHOSPHOR CRYSTALS Final Report, 15 Jan. 1979 - 14 Jan. 1982

Richard C. Powell 14 Jan. 1982 115 p refs

(Contract DAAG29-80-C-0052; Grant DAAG29-79-G-0048)

(AD-A110886; ARO-16182.11-P) Avail: NTIS HC A06/MF A01 CSCL 07/4

This research involves the utilization of laser optics such as time-resolved site-selection spectroscopy, photoacoustic spectroscopy, and four-wave mixing spectroscopy to characterize dynamical optical properties such as energy transfer and radiationless relaxation processes in phosphor and laser materials. The materials investigated included stoichiometric laser materials such as neodymium pentaphosphate and neodymium aluminum borate, and lightly doped laser materials such as neodymium doped yttrium vanadate, garnets and glasses. In addition, several theoretical approaches and computer modeling techniques were developed for analyzing the properties of energy transfer among ions in solids. Some of the important results obtained in this work include the direct measurement of the exciton diffusion coefficient in Nd sub x La sub 1-x P5O14 crystals, the measurement of the quantum efficiency of Nd(3+) in various hosts, and the development of Monte Carlo modeling techniques for describing energy migration on a random lattice. GRA

N82-25314# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

DECENTRALIZED CONTROL OF LARGE SPACE STRUCTURES M.S. Thesis

William T. Miller Dec. 1981 85 p refs

(AD-A111171; AFIT/GAE/AA/81D-20) Avail: NTIS HC A05/MF A01 CSCL 22/1

A development and analysis of a single controller, before and after the elimination of 'spillover' terms, is implemented to attempt to achieve desired response characteristics of the structure under evaluation. Using this derived data as a basis for comparison, a pair of decentralized controllers are implemented on the structure. Problems encountered with the implementation of more than two decentralized controllers are investigated. The structure used for the investigation is a lumped mass tetrahedron. Author (GRA)

N82-25315# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

DESIGN OF A DIGITAL CONTROLLER FOR A LARGE FLEXIBLE SPACE STRUCTURE M.S. Thesis

David B. Leggett Dec. 1981 119 p refs

(AD-A111170; AFIT/GAE/AA/81D-18) Avail: NTIS HC A06/MF A01 CSCL 22/2

Modern optimal control techniques are used to design a digital controller for a large flexible space structure. The structure is modeled as a tetrahedron formed by four lumped masses connected by massless truss members. A NASTRAN analysis is used to generate the twelve mode shapes and frequencies of oscillation. The controller is designed in discrete-time using linear optimal regulator theory. An observer is used to estimate the states. Active control is achieved using six collocated sensor actuator pairs. The effectiveness of the controller is determined using pointing accuracy as a figure of merit. Three controller designs are compared. The first demonstrates the effects of 'control' and 'observation spillover.' The second uses a singular value decomposition to eliminate the spillover terms. The third design uses a more accurate optimal performance index than the first two. The first design proved inadequate to achieve the desired performance. The second and third designs were able to achieve the desired performance for small sampling times. For small sampling times the simplified performance index used in Design II proved to provide a very accurate approximation to the optimal. Author (GRA)

N82-25316# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany). Structures Dept.

STANDARDIZATION PROGRAM ON DESIGN ANALYSIS AND TESTING OF INSERTS Final Report

W. Hertel, W. Paul, and D. Wagner Paris ESA 13 Feb. 1981 425 p refs

(Contracts ESA-3442/77/NL-PP; ERN-3442/77-31)

(TR-AD15/A2; ESA-CR(P)-1498) Avail: NTIS HC A18/MF A01

Criteria for choosing insert type and size are presented and strength/life testing under loading is described. Preparation of holes in sandwich plates and insert implementation by potting are outlined. The standard insert consists of a cylindrical double flanged element with a concentric threaded hole. Resin can be injected via openings in the upper (outer) flange. Cuts/planes on the inner flange prevent rotation in cases of insufficient bonding. The test program comprises basic material, insert strength, and verification tests. Sheet thicknesses of 0.1 to 0.2 mm are achieved for aluminum alloy face sheets by chemically milling thicker sheets. Author (ESA)

N82-25317# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Aeroelastik.

DYNAMIC STRUCTURAL ANALYSES OF A SPACECRAFT USING EXPERIMENTAL MODAL DATA Final Report

A. Bertram and P. Conrad Paris ESA 12 May 1981 96 p refs

(Contract ESTEC-3347/77/NL-PP(SC))

(DFVLR-IB-232-81-C-06; ESA-CR(P)-1510) Avail: NTIS HC A05/MF A01

Application of software for modal coupling (MODAC) and configuration change calculation (DIMOC) to a complicated modular spacecraft structure with typical interface connections and appendages using data from structures already tested experimentally is summarized. Criteria for selecting the most suitable mode sets for modal synthesis are established. The characteristics of the complete spacecraft are determined for the structural dynamic synthesis by using an analytical model constructed by coupling the normal modes of the individual structure modules. The modal parameters required for the coupling are reduced from modal survey test data. The modal data of a modified spacecraft configuration for small configuration modifications are derived from the modal parameters of the unmodified spacecraft. The DIMOC program gives exact results for structures described by a complete set of modes, and also MODAC performs well. Author (ESA)

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

N82-25318*# Texas Univ., Dallas. Center for Space Sciences.

ION DRIFT METER FOR DYNAMICS EXPLORER Final Report

R. A. Heelis, W. B. Hanson, C. R. Lippincott, and D. R. Zuccaro Feb. 1982 33 p refs

(Contracts NAS5-24297; NAS5-24298; NAS5-26071; NAS5-26068)

(NASA-CR-166795; NAS 1.26:166795) Avail: NTIS HC A03/MF A01 CSCL 14B

The ion drift meter for Dynamics Explorer B is discussed. It measures two mutually perpendicular angles of arrival of thermal ions with respect to the sensor look directions. These angles lie in the vertical and horizontal planes and may be thought of as pitch and yaw in the conventional aerodynamic sense. The components of the ion drift velocity along vertical and horizontal axes through the spacecraft body are derived to first order from

knowledge of the spacecraft velocity vector and more accurately with additional knowledge of the component of ion drift along the sensor look direction. B.W.

N82-25319# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
ACTIVE MICROWAVE INSTRUMENTATION (AMI) OPTIMIZATION. VOLUME 1: EXECUTIVE SUMMARY Final Report
B. Theile Paris ESA Jul. 1981 53 p refs
(Contract ESA-4656/81/F-DD(SC))
(ESA-CR(P)-1530) Avail: NTIS HC A01/MF A01

The design and system specifications of a spaceborne instrument which combines SAR and scatterometer techniques are presented. The instrument provides imaging, wave and wind radar modes. Optimization involves sequential operation of these modes on board ERS-1. The ground imaging mode requires average resolution (900 sq m or 10,000 sq m) and good radiometric accuracy (better than 2.5 db for the 900 sq m and better than 1 db for the 10,000 sq m). This is achieved by multilook processing. The imaging mode operates continuously during a 10 min period each orbit cycle. The wave mode requires high spatial resolution (as short as 100 m ocean wavelength should be detected) at low radiometric accuracy. The last processing step is a two dimensional Fourier transform of the observed scene. The wave mode operates in an interleaving mode with the wind mode. Author (ESA)

N82-25320# Graz Univ. (Austria). Inst. fuer Nachrichtentechnik und Wellenausbreitung.
SELECTION CRITERIA FOR CONTINUOUS CHANNEL ELECTRON MULTIPLIERS IN SPACE APPLICATIONS
A. Urban 1981 29 p refs Submitted for publication Sponsored by Austrian Academy of Sciences and Austrian Council for Science Research
(INW-8108) Avail: NTIS HC A03/MF A01

Mullard multipliers were tested and classified as good, marginal or poor. Gain fatigue versus accumulated counts, pulse height distribution change during lifetime, gain degradation versus count rates, gain versus operating voltage and resolution versus operating voltage were investigated, using a tritium source. Relative efficiency versus electron energy as a function of operating voltage was measured, using a monoenergetic electron beam. From all tested devices, 25% have very low gain and do not operate as required at the end of 4 billion accumulated counts. About 40% of all devices are classified as good multipliers. They exhibit gain recovery after 3 billion accumulated counts, with progressive gain stabilizing. Multipliers classified as marginal show unexpected behavior during the lifetime, but a gain recovery phase and gain plateau region can be identified. Author (ESA)

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N82-25321# National Aerospace Lab., Tokyo (Japan).
PERFORMANCE EVALUATION OF LOX AND LH2 TURBOPUMP TURBINES FOR A 10 TON THRUST LOX/LH2 ROCKET ENGINE
Ryohei Hashimoto, Kenjiro Kamijo, Yoshiaki Watanabe, Satoshi Hasegawa, and Toshihiko Fujita Dec. 1981 32 p refs In JAPANESE; ENGLISH summary
(NAL-TR-691; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

The aerodynamic performance evaluation of the pump-drive turbines for a 10 ton thrust liquid oxygen and liquid hydrogen (LOX and LH2) gas generator cycle propulsion system, which has dual-shaft series turbines, was tested mainly using cold nitrogen gas. At design equivalent speed and pressure ratio, the LOX turbine static efficiency was about 35 percent compared to the design value of 32.8 percent. The LH2 turbine static efficiency was very close to the design value of 45 percent. Equivalent weight flow of both turbines was greater than the design value. The specifications of the turbines were changed in order to utilize the present test results, although no design modifications were made on either turbine. R.J.F.

N82-25322# Ogden Air Logistics Center, Hill AFB, Utah. Component and Combustion Test Unit.
QUALIFICATION OF A NEW MAPO SOURCE AND ERL-510 CURING AGENT FOR MINUTEMAN STAGE 1 UF-2121 LINER Semiannual Test Results Report
John A. Thompson Jan. 1982 24 p
(AD-A111330; MANPA-NR-464(82)) Avail: NTIS HC A02/MF A01 CSCL 21/8

Thiokol Chemical Corporation/Wasatch Division uses MAPO in the production of UF-2121 liner. Thiokol changed MAPO vendors and, therefore, qualification of the new source MAPO was required. Thiokol prepared specimens from the new source and also specimens from the original source which are to be used as the control material in the 10 year surveillance testing program. The specimens were transferred to Ogden ALC for testing and reporting of the data obtained. This report includes the test results for the first through the seventh time testing of the control and special specimens at Ogden ALC. Statistical analysis of the test data showed that the physical properties of the new source compared closely to the old source of UF-2121 liner specimens. In all instances, the mean data for the control and special specimens are well above the minimum requirements found in TWR-7857 REV A, Thiokol specimen data. Therefore, the capability of the liner from the new source material is expected to perform satisfactorily. Author (GRA)

N82-25323# Fulmer Research Inst. Ltd., Stoke Poges (England).
TESTING OF TUNGSTEN EMITTERS Final Report
D. Stewart and P. D. Wilson Paris ESA Jun. 1981 78 p refs
(Contract ESTEC-4009/79/NL-AK(SC))
(FRI-R664; ESA-CR(P)-1536) Avail: NTIS HC A05/MF A01

Alternative propellants to cesium in ion thrusters and the use of tungsten to replace nickel mesh in emitters were studied. The propellants tested were gallium, gallium-indium and indium. Best results are obtained from indium with a slit emitter. An emission current of 20 mA at an extraction voltage of 22 kV is produced from a 5 mm edge length. The tungsten arrays are unsuitable for use in thruster modules because starvation of propellant to needle tips limits the stable emission level. Author (ESA)

N82-26172# National Defence Academy, Pune (India). Dept. of Mathematics.
VARIABLE THRUST PROGRAMMING FOR ROCKETS FLOWN WITH CONSTANT THRUST INCLINATION WITH RESPECT TO HORIZON IN VACUUM
S. N. Maitra *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 85-93 refs (For primary document see N82-26161 16-99)
Avail: NTIS HC A08/MF A01

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

No abstracts in this category.

24 COMPOSITE MATERIALS

Includes laminates.

N82-25324*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

GRAPHITE/POLYIMIDE STRUCTURAL APPLICATIONS Patent Application
Robert M. Baucom and Paul W. Kidder, inventors (to NASA) Filed 30 Nov. 1981 16 p
(NASA-Case-LAR-12547-1; US-Patent-Appl-SN-325934) Avail: NTIS HC A02/MF A01 CSCL 11D

An article of manufacture comprising a stabilized graphite/polyimide composite preform and the process for making same is disclosed. Sheets of graphite/polyimide prepreg are layered in a desired orientation and staged in an air circulation oven, under modest vacuum pressure and temperature to reduce the solvent content therein to less than one percent and to convert at least 25% of the resin to the oligomer form. The resulting preform is stable and may be stored under ambient conditions for an extended period of time without losing its desirable physical property characteristics. The preform may then be placed in the mold cavity of a preheated tool and shaped to desired contour by platen press-type curing methods. The preforming process stabilizes the fiber/polyimide prepreg and eliminates the need for the immediate use of prepregs as they are formed to prevent deterioration. NASA

N82-25325*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXPERIMENTAL DATA ON SINGLE-BOLT JOINTS IN QUASI ISOTROPIC GRAPHITE/POLYIMIDE LAMINATES
Gregory R. Wichorek May 1982 45 p refs
(NASA-TP-2015; L-15103; NAS 1.60:2015) Avail: NTIS HC A03/MF A01 CSCL 11D

Sixteen ply, quasi-isotropic laminates of Celanese Celion 6000/PMR-15 and Celion 6000/LARC-160 with a fiber orientation of (0/45/90/-45) sub 2S were evaluated. Tensile and open hole specimens were tested at room temperature to establish laminate tensile strength and net tensile strength at an unloaded bolt hole. Double lap joint specimens with a single 4.83-mm (0.19 in.) diameter bolt torqued to 1.7 N-m (15 lbf-in.) were tested in tension at temperatures of 116 K (-250F), 297 K (75F), and 589 K (600F). The joint ratios of w/d (specimen width to hole diameter) and e/d (edge distance to hole diameter) were varied from 4 to 6 and from 2 to 4, respectively. The effect of joint geometry and temperature on failure mode and joint stresses are shown. Joint stresses calculated at maximum load for each joint geometry and test temperature are reported. Joint strength in net tension, bearing, and shear out at 116 K (-250F), 297 K (75F), and 589 K (600F) are given for the Celion 6000/PMR-15 and Celion 6000/LARC-160 laminates. T.M.

N82-25326*# Advanced Research and Applications Corp., Sunnyvale, Calif.
DEFORMATION AND FAILURE MECHANISMS OF GRAPHITE/EPOXY COMPOSITES UNDER STATIC LOADING Final Report
Linda L. Clements Sep. 1981 63 p refs
(Contract NAS2-9989)
(NASA-CR-166328; NAS 1.26:166328; FR-22-3) Avail: NTIS HC A04/MF A01 CSCL 11D

The mechanisms of deformation and failure of graphite epoxy composites under static loading were clarified. The influence of moisture and temperature upon these mechanisms were also investigated. Because the longitudinal tensile properties are the most critical to the performance of the composite, these properties were investigated in detail. Both ultimate and elastic mechanical properties were investigated, but the study of mechanisms emphasized those leading to failure of the composite. The graphite epoxy composite selected for study was the system being used in several NASA sponsored flight test programs. S.L.

N82-25327*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN EQUATION FOR BOLT CLAMPUP RELAXATION IN TRANSIENT ENVIRONMENTS
K. N. Shivakumar and J. H. Crews, Jr. Apr. 1982 15 p refs
(NASA-TM-84480; NAS 1.15:84480) Avail: NTIS HC A02/MF A01 CSCL 11D

An equation for bolt clampup relaxation for transient temperature-moisture (T-M) conditions was derived starting with a relaxation equation for steady-state conditions, and then using an incremental time approach that exploits the superposition principle for linear viscoelasticity. The resulting equation uses the initial T-M condition (at the time of clamping), the T-M history after clamping, and elastic clampup coefficients for temperature and moisture changes. For a given material and joint configuration, the clampup coefficients are constants that can be calculated by elastic analyses. The clampup equation was used to calculate the changes in clampup occurring in a T300/5208 graphite/epoxy joint exposed to a one-yer history of temperature and moisture. Two cases were considered: one was a dry joint exposed to a relatively humid environment and the other was a nearly saturated joint exposed to an arid environment. M.G.

N82-25328*# Rohr Industries, Inc., Chula Vista, Calif.
EXTENSIONAL, BENDING AND TWISTING STIFFNESS OF TITANIUM MULTIWALL THERMAL PROTECTION SYSTEM (TPS) Interim Report
J. E. Meaney Apr. 1982 52 p refs
(Contract NAS1-15646)
(NASA-CR-165866; NAS 1.26:165866) Avail: NTIS HC A04/MF A01 CSCL 11D

A test program which determines the extensional, bending and torsional stiffness of various titanium multiwall sandwich configurations is described. It is shown that unlike honeycomb core, the dimpled core is a significant contributor to the stiffness and strength of the sandwich. the extensional stiffness test shows irregularities which are attributed to foil thickness variations and to the difficulty to determine linear values from nonlinear tests. E.A.K.

N82-25329# Texas Univ. at Arlington. Materials Science and Engineering.
INTERFACE CHARACTER OF ALUMINUM-GRAPHITE METAL MATRIX COMPOSITES Annual Technical Report, 1 Dec. 1980 - 30 Nov. 1981
Harris L. Marcus 27 Jan. 1982 91 p refs
(Contract N00014-78-C-0094)
(AD-A110787; UTMSE-82-1) Avail: NTIS HC A05/MF A01 CSCL 11/4

The results of the research described in this annual report can be summarized in terms of the experimental approaches used. The materials studied included the commercial 6061 VSB 32 composites as well as layered model systems on single crystal and polycrystal-line graphite substrates and glassy carbon substrates. The I/V characterization of the interface demonstrated that the oxide within the interface plays a major role in the interface strength. If the interface was in a low conductivity state, fracture occurred at the interface weaving though the oxide. When the interface was switched into an electrically conductive state, fracture occurred within the single crystal graphite substrate. The interface strength was directly correlatable with its conductivity state. AES was used to identify the fracture path and the chemistry of the model laminate. TEM of the commercial materials and the model laminates again showed the presence of gamma Al2O3, MgAl2O3 and TiB2 in the as-prepared samples. GRA

N82-25330# Ohio State Univ., Columbus. Dept. of Engineering Mechanics.
SCATTERING OF WAVES BY VISCOELASTIC COMPOSITES AND THE CHARACTERIZATION OF THEIR DYNAMIC PROPERTIES Final Report, 1 Apr. 1980 - 30 Sep. 1981
V. V. Varadan and V. K. Varadan 13 Jan. 1982 103 p refs
(Contract N00014-80-C-0483)
(AD-A110925) Avail: NTIS HC A06/MF A01 CSCL 11/4

The propagation of electromagnetic waves in an infinite medium composed of a random distribution of identical, finite scatterers is studied. The T-matrix of a single isolated scatterer, obtained by using the null field equation, is used to make the equations for the field incident on a particular scatterer and the field scattered by it, self consistent. The method we propose is well suited for computations at wavelengths comparable to obstacle size and for non-spherical obstacles. The attenuation associated with the coherent field as predicted by our computations is compared with the only two sets of experimental results

that can be found in the literature. Agreements and discrepancies are examined and the range of validity of the assumed quasi-crystalline approximation is discussed. Further improvements using the coherent potential approximation and the 'self consistent approximation' as well as improved models of the pair correlation function are suggested. Author (GRA)

N82-25331# Delaware Univ., Newark. Dept. of Chemistry.
MOLECULAR DYNAMICS OF NITRAMINES AND HIGH ENERGY COMPOSITE MATERIALS Annual Interim Report, 1 Oct. 1980 - 30 Sep. 1981
Thomas B. Brill Nov. 1981 9 p refs
(Grant AF-AFOSR-0285-80; AF Proj. 2308)
(AD-A111233; AFOSR-81-0838TR) Avail: NTIS HC A02/MF A01 CSCL 11/4

Determination of the pressure-temperature phase diagram of the beta-to-delta polymer conversion of HMX has been completed. Enthalpy, entropy values were determined as was the effect of particle size. Variations in the nature of decomposition were found to be the source of the observed slope breaks and the particle size effect. The mechanism of motion in beta-HMX up to the phase transition temperature was found to involve disruption of the pivoting motion about the most stabilizing intermolecular interaction in HMX. GRA

N82-25332# Japan Atomic Energy Research Inst., Tokyo. Div. of Nuclear Fuel Research.
REACTION OF NUCLEAR GRAPHITE WITH OXYGEN UNDER GAMMA-RAY IRRADIATION
Hisashi Imai, Kimio Fujii, Shinzo Nomura, Takeshi Kurosawa, and Yasuichi Sasaki May 1980 21 p refs In JAPANESE; ENGLISH summary
(JAERI-M-8848) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The reaction of four kinds of nuclear graphites with oxygen under Co-60 gamma-ray irradiation were examined in the gas flow at 1 atm, at temperatures 25 C to 2040 C and gamma dose rates 3.8 to 12.5 x 10 (to the 5th power) R/hr. Air and oxygen diluted with helium were also used as the atmosphere. Radiation induced oxidation rates of the graphites in pure oxygen at dose rate 12.5 x 10 (to the 5th power) R/hr were found to be 6.6 to 7.5 x 10 (to the -8 power g/g.hr, showing little differences between the graphites. Over all oxidation rate of the graphites increased with temperature, but the radiation induced rate kept constant with temperature. The increase of the over all rate at high temperatures was concluded to be due to the increase in thermally induced oxidation rate. The radiation induced oxidation rate was expressed as R = 8.3 x 10 (to the -12 power) (D) sup (0.64), where R is the radiation induced oxidation rate in g/g.hr and D is the dose rate in R/hr. Oxidation rate of the graphite in air was about 40% of that in pure oxygen, and that in the oxygen diluted with helium was constant 15% in 0.2 to 1.0 vol.% oxygen. It was shown that the gamma-rays in a reactor would little influence oxidation of the structural graphite at high temperatures. DOE

N82-25333# Instituut TNO voor Werktuigkundige Constructies, Delft (Netherlands).
STRENGTH CRITERIA FOR COMPOSITE MATERIALS (A LITERATURE SURVEY) [STERKTECRITERIA VOOR COMPOSIETMATERIALEN (EEN LITERATUUR OVERZICHT)]
F. Roode Jan. 1980 46 p refs In DUTCH; ENGLISH summary
(Contract A73/KM/106)
(IWECO-5071104-80-1; TDCK-75128) Avail: NTIS HC A03/MF A01

Literature concerning strength (failure) criteria for composite materials is reviewed, with emphasis on phenomenological failure criteria. These criteria are primarily intended to give a good estimation of the safety margin with respect to failure for arbitrary multiaxial stress states. The failure criteria do not indicate the types of fracture that will occur in the material. The collection of failure criteria is evaluated for applicability for the glass reinforced plastics used in mine detectors. Material tests necessary to determine the parameters in the failure criteria are discussed. Author (ESA)

N82-25334# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehfluegler.
CALCULATION OF THE CROSS SECTION PROPERTIES AND THE SHEAR STRESSES OF COMPOSITE ROTOR BLADES
Rudolf Woerndle 8 Sep. 1981 32 p refs Presented at 7th European Rotorcraft and Powered Lift Aircraft Forum, Garmisch-Partenkirchen, West Germany, 8-11 Sep. 1981; sponsored by DGLR
(MBB-UD-334-81-O) Avail: NTIS HC A03/MF A01

Shear stress distribution and shear stiffness of transversely loaded cylindrical beams of any cross sectional shape are determined, using the finite element method. Warp, resulting from transverse load, is calculated with special two dimensional elements. If the warping of any cross section is known, shear stress distribution, shear stiffness, and shear center can be found. These values are obtained for any cross section through two dimensional analysis and, therefore, the whole structure must be considered. Stress distribution calculation results for complicated cross secions, i.e., for material that is homogeneous or inhomogeneous, isotropic or orthotropic, are shown. Because only small amounts of computational effort are necessary, the method is appropriate to the early design state. However, the validity of the theory is limited to small conus angles. Author (ESA)

N82-26165# Aeronautical Development Establishment, Bangalore (India).
ANALYSIS OF INTERFACE STRESSES IN PHOTOELASTIC COMPOSITES
K. Abraham Jacob *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 27-36 refs (For primary document see N82-26161 16-99)
Avail: NTIS HC A08/MF A01

N82-26171# National Aeronautical Lab., Bangalore (India). Structures Div.
TRANSIENT HEAT CONDUCTION ANALYSIS OF LAMINATED COMPOSITE NOSE CONE
J. M. Mahishi, Ramesh Chandra, and M. V. V. Murthy *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 77-84 refs (For primary document see N82-26161 16-99)
Avail: NTIS HC A08/MF A01

N82-26183# Hindustan Aeronautics Ltd., Bangalore (India). Central Lab., Foundry and Forge Div.
FATIGUE OF GLASS FIBRE REINFORCED LAMINATES
P. K. Kurien and Krishnadas Nair *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 143-147 refs (For primary document see N82-26161 16-99)
Avail: NTIS HC A08/MF A01

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N82-25335*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
METHOD FOR TREATING WASTEWATER USING MICROORGANISMS AND VASCULAR AQUATIC PLANTS Patent Application
Billy C. Wolverton, Inventor (to NASA) Filed 28 Dec. 1981 22 p
(NASA-Case-NSTL-10-1; US-Patent-Appl-SN-335036) Avail: NTIS HC A02/MF A01 CSCL 07D

An invention relating to waste water treatment is described. The waste water is subjected to anaerobic settling for at least six hours, the resulting effluent passing upward through a filter

cell in which the effluent is first subjected to the action of an aerobic and facultative microorganisms and then to aerobic microorganisms and the roots of a vascular aquatic plant. Details of the processes are given. The novelty of the invention resides in the combined use of microorganisms and aquatic plant roots in a filter bed. This enables removal of phosphorous, ammonia and potassium impurities which are not normally removed by bacteria alone. NASA

N82-25336# Council for Scientific and Industrial Research, Pretoria (South Africa).
ON THE PROCESSING OF MANGANESE NODULES WITH SULPHUR CONTAINING REAGENTS
K-H. Schwarz and U. Boin 1981 15 p refs Transl. into ENGLISH from Erzmetall (West Germany), v. 27, no. 7-8, 1974 p 341-345
(CSIR-Trans-1603) Avail: NTIS HC A02/MF A01

Sulphating/roasting of manganese nodules and leaching with SO2 in a slurry are discussed as methods of breaking down manganese nodules. Roasting conditions, leaching parameters, and specific energy costs are addressed. Author

N82-25337*# General Electric Co., Syracuse, N.Y. Gas Turbine Div.
LOW NO SUB x HEAVY FUEL COMBUSTOR CONCEPT PROGRAM PHASE 1A GAS TESTS
M. B. Cutrone, Kenneth W. Beebe, and Martin B. Cutrone Apr. 1982 135 p refs
(Contract DEN3-147)
(NASA-CR-167877; DOE/NASA/0147-2; NAS 1.26:167877) Avail: NTIS HC A07/MF A01 CSCL 21B

The emissions performance of a rich lean combustor (developed for liquid fuels) for combustion of simulated coal gases ranging in heating value from 167 to 244 Btu/scf were assessed. The 244 Btu/scf gas is typical of the product gas from an oxygen blown gasifier, while the 167 Btu/scf gas is similar to that from an air blown gasifier. Although meeting NOx goals for the 167 Btu/scf gas, NOx performance of the rich lean combustor did not meet program goals with the 244 Btu/scf gas because of high thermal NOx, similar to levels expected from conventional lean burning combustors. The NOx emissions are attributed to inadequate fuel air mixing in the rich stage resulting from the design of the large central fuel nozzle delivering 71% of the total gas flow. NOx generation from NH3 was significant at ammonia concentrations significantly less tha 0.5%. These levels occur depending on fuel gas cleanup system design, However, NOx yield from ammonia injected into the fuel gas decreased rapidly with increasing ammonia level, and is projected to be less than 10% at NH3 levels of 0.5% or higher. S.L.

N82-25338*# Detroit Diesel Allison, Indianapolis, Ind.
LOW NOx HEAVY FUEL COMBUSTOR CONCEPT PROGRAM ADDENDUM: LOW/MID HEATING VALUE GASEOUS FUEL EVALUATION Final Report, Apr. 1981 - Feb. 1982
A. S. Novick and D. L. Troth Apr. 1982 77 p refs
(Contract DEN3-148)
(NASA-CR-165615; DOE/NASA/0148-2; NAS 1.26:165615; EDR-10950) Avail: NTIS HC A05/MF A01 CSCL 21B

The combustion performance of a rich/quench/lean (RQL) combustor was evaluated when operated on low and mid heating value gaseous fuels. Two synthesized fuels were prepared having lower heating values of 10.2 MJ/cu m. (274 Btu/scf) and 6.6 MJ/cu m (176 Btu/scf). These fuels were configured to be representative of actual fuels, being composed primarily of nitrogen, hydrogen, carbon monoxide, and carbon dioxide. A liquid fuel air assist fuel nozzle was modified to inject both of the gaseous fuels. The RQL combustor liner was not changed from the configuration used when the liquid fuels were tested. Both gaseous fuels were tested over a range of power levels from 50 percent load to maximum rated power of the DDN Model 570-K industrial gas turbine engine. Exhaust emissions were recorded for four power level at several rich zone equivalence ratios to determine NOx sensitivity to the rich zone operating point. For the mid Btu heating value gas, ammonia was added to the fuel to simulate a fuel bound nitrogen type gaseous fuel. Results at the testing showed that for the low heating value fuel NOx emissions were all below 20 ppmc and smoke was below a 10 smoke number. For the mid heating value fuel, NOx emissions were in the 50 to 70 ppmc range with the smoke below a 10 smoke number. S.L.

N82-25339# National Physical Lab., Teddington (England). Div. of Materials Applications.
AUGER ELECTRON SPECTROSCOPY
M. P. Seah Feb. 1982 31 p refs
(NPL-DMA(A)-40; ISSN-0143-7313) Avail: NTIS HC A03/MF A01

The restricting limits of Auger spectroscopy are defined in order to show what information can be obtained with confidence. Principles and instrumentation are outlined. Spectral quantification of homogeneous binary alloys, adsorbates (homogeneous samples with fractional monolayer coverage) and composition depth profiles (differential sputtering of a homogeneous binary alloy) is considered. While measurements in the peak area of the differential energy spectrum (DES) give better quantification than measurements in the derivative spectrum, no general method exists for defining the area to be measured to obtain the relative sensitivity factors for the DES. All methods are strongly influenced by boundary conditions. Three dimensional quantitative compositional analysis is possible for all elements except H and He, with 500 A spatial resolution and 15 to 200 A depth resolution. Author (ESA)

N82-25340# University of Southern California, Los Angeles.
EXPERIMENTAL STUDIES OF THE STATE-TO-STATE CHEMICAL DYNAMICS OF REACTIONS INVOLVING AIR TRIATOMICS Final Report
R. R. Herm, B. J. Sullivan, and M. E. Whitson, Jr. 1 Nov. 1981 101 p refs
(Grant AF-AFOSR-77-3348; AF Proj. 2303)
(AD-A111889; AFOSR-82-0102TR) Avail: NTIS HC A06/MF A01 CSCL 20/5

The first measurements of the full vibrational distribution of NO produced in the room temperature reaction N(4S) + O2 yields NO (0 < or = 7) + O are reported in this work. The technique of UV laser induced fluorescence detection of NO(v) was employed, which permitted observation of NO production under conditions where O2 vibrational quenching of the NO(v) was insignificant. The technique permitted the first observation of NO(v=0) and NO(v=1) concentrations. The relative ratios of (NO(v))/k sub D superscript v were measured, where k sub D superscript v is the vibrationally dependent rate of NO removal by the reaction N(4S) + NO(v) yields k sub D superscript v sub N2 + O. Assuming that k sub D superscript v is independent of v, we calculate that the NO vibrational distribution ratios for O < or = 57.8: 4.2: 5.7: 6.9: 5.8: 6.5: 6.6: 6.5, expressed as % of total NO production. This result indicates that the N(4S) + O2 reaction produces 42% of the NO molecules in infrared-active states, 38% of them in levels > or = 2. In terms of energy deposition, 29% of the 1.39 eV exothermicity of the reaction goes into v > or = 1, 28% into v > or = 2; this is approximately 3 times more than predicted by earlier studies. GRA

N82-25341# Pennsylvania Univ., Philadelphia. Office of Project Research and Grants.
THE ROLE OF CHEMICAL BONDING IN GRAIN BOUNDARY EMBRITTLEMENT Interim Report
R. P. Messmer and C. L. Briant 10 Feb. 1982 35 p refs Submitted for publication Prepared in cooperation with General Electric Co., Schenectady, N.Y.
(Contract N00014-79-C-0991)
(AD-A111399; TR-10) Avail: NTIS HC A03/MF A01 CSCL 07/2

Brittle intergranular fracture occurs when impurity elements segregate to the grain boundaries of a material and lower their cohesive strength. Although many embrittling elements have been identified by experimental studies, the reason why these elements cause embrittlement has remained elusive. This paper presents results of fully quantum mechanical cluster calculations which address this question. It will be shown that strong embrittling elements draw charge from the neighboring metal atoms onto themselves. They thus remove charge from the metal-metal bonds which hold the grain boundary together and

weaken them. Cohesive enhancers do not draw charge off the metal atoms and thus do not weaken the metal-metal bond network. In addition, they form rather homopolar bonds with the metal atoms and thus provide an added increment of bonding in the grain boundary. Author (GRA)

N82-25342# Maine Univ., Orono. Dept. of Physics and Astronomy.

RENORMALIZATION GROUP TREATMENT FOR O/W(110)

C.-K. Hu and P. Kleban 17 Feb. 1982 21 p refs
(Contract N00014-79-C-0441; Grant NSF DMR-80-06328)
(AD-A111747; TR-8) Avail: NTIS HC A02/MF A01 CSCL 07/4

We consider the lattice gas model of the O/W(110) chemisorption system. We calculate the transition temperature T sub c at one half coverage by means of a new renormalization group treatment. Good agreement (< or = 10%) with T sub c obtained via Monte Carlo studies is found over a wide range of parameter values. We explore the remarkable independence of T sub c from epsilon sub 1, the nearest neighbor adatom-adatom interaction. We also give several arguments indicating that the transition at this coverage is in the simple Ising universality class. Author (GRA)

N82-25343# University of Southern California, Los Angeles. Dept. of Chemistry.

DIAGNOSTICS AND CHEMICAL APPLICATIONS OF MULTIPHOTON ABSORPTION PROCESSES Final Scientific Report, 1 Apr. 1977 - 30 Sep. 1981

Sidney W. Benson 30 Sep. 1981 5 p refs
(Grant AF-AFOSR-3279-77; AF Proj. 2303)
(AD-A111155; AFOSR-82-0063TR) Avail: NTIS HC A02/MF A01 CSCL 20/10

To examine and analyze quantitatively the mechanism and parameters of the processes of multiphoton absorption from intense laser fields and to observe and measure the intramolecular dynamic processes following such absorption. GRA

N82-25344# Wisconsin Univ. - Madison. Mathematics Research Center.

ON SHAPE NORMALIZATION FOR NON-UNIFORMLY ACTIVE CATALYST PELLETS, 3

M. Morbidelli and A. Varma Oct. 1981 25 p refs
(Contract DAAG29-80-C-0041)
(AD-A110448; MRC-TSR-2289) Avail: NTIS HC A02/MF A01 CSCL 07/4

A new shape normalization for non-uniformly active isothermal catalyst pellets is developed. It is based on the volume average of catalyst activity in a thin reaction zone near the external surface of the active catalyst region, wherein the reaction occurs in the diffusion-controlled regime. This normalization permits inclusion of those catalyst activity profiles that become zero at the external surface of the catalytically active region, which were excluded from previous normalizations. When the surface activity is nonzero, results reduce to those obtained earlier. The normalization provides exactly the slope of the effectiveness factor, Thiele modulus curves, for all pellet shapes and activity profiles, in the limit of diffusion-control. The development is initially made for first-order reactions, and then generalized to include arbitrary reaction rate expressions. Effects of finite external mass transfer resistances are also discussed. GRA

N82-25345# Wisconsin Univ. - Madison. Mathematics Research Center.

NUMERICAL METHODS FOR SOLVING A PREMIXED LAMINAR FLAME

Xi-Chang Zhong Oct. 1981 38 p refs
(Contract DAAG29-80-C-0041)
(AD-A110449; MRC-TSR-2292) Avail: NTIS HC A03/MF A01 CSCL 21/2

A splitting-up method and an implicit finite difference method are presented to solve time-dependent, one dimensional, laminar, premixed flame problems. An example for studying the development of an ozone decomposition flame is calculated. A movable boundary technique is adopted, therefore the grid points can be significantly reduced. Special care is taken to maintain the accuracy of the solution. The results are checked in many ways. All checks show that the present method is satisfactory. Author (GRA)

N82-25346# Naval Research Lab., Washington, D. C.

PROGRESS IN CONCEPTS OF CONFORMATIONAL SWITCHING AND MOLECULAR ELECTRONIC DEVICES Interim Report

Forrest L. Carter 27 Jan. 1982 24 p refs
(RR0130243)
(AD-A110752; NRL-MR-4717) Avail: NTIS HC A02/MF A01 CSCL 07/4

The importance of molecular conformational changes as switching mechanisms in proposed molecular electronic devices is stressed. Primarily two types of phenomena are considered; a molecular tunnelling analogue to a NOR gate and a variety of soliton phenomenon. These include soliton switching, soliton valving, proton tunnelling and soliton generation, soliton reversal, and soliton transport as a memory device. Also briefly considered is the proposed uses of the valence-bonded surface contact and the very small electrochemical cell in the controlled synthesis of molecular devices. Author (GRA)

N82-25347# Pennsylvania Univ., Philadelphia.

RAMAN SPECTROSCOPY OF SOLIDS Final Report, 1 Oct. 1979 - 31 Oct. 1981

Elias Burstein 28 Dec. 1981 11 p refs
(Contract DAAG29-80-C-0066)
(AD-A110740; ARO-14332.11-P) Avail: NTIS HC A02/MF A01 CSCL 07/4

Resonant Raman scattering at the E1 gap was used to investigate the scattering by coupled LO phonon collective inter-subband charge carrier excitation in quasi-two dimensional plasmas. The InAs surface of MOS junctions found on n- and p- InAs surfaces were studied. GRA

N82-25348# Pennsylvania Univ., Philadelphia. Dept. of Chemistry.

STUDIES OF NON-RADIATING SPECIES IN METAL + OXIDANT CHEMILUMINESCENT FLAMES Final Report, 31 Dec. 1978 - 31 May 1981

J. Gary Pruett May 1981 24 p refs
(Contract F49620-79-C-0023; AF Proj. 2303)
(AD-A111116; AFOSR-82-0062TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

Chemical production of metastable states of barium oxide in the gas phase have been studied under low pressure flow and molecular beam relaxation free conditions. Optical-optical double resonance excitation of ground state barium oxide has allowed measurements of excited state radiative lifetimes, electronic transition moments and a variety of energy transfer processes. The reactions of Barium with nitrous oxide and nitric oxide are found to produce mostly ground electronic state products, with some production of metastable triplet and singlet states. Electronic transition moments cannot be explained by simple atomic orbital descriptions of molecular states. Rotational relaxation in the first excited singlet pi state of barium oxide is found to be faster than gas kinetic and also exceeds the relaxation rate between lambda components of the pi state. Author (GRA)

N82-25349# Pennsylvania Univ., Philadelphia. Dept. of Chemistry.

ELECTROCHEMICAL ISOMERIZATION OF CIS-(CH) SUB X TO TRANS-(CH) SUB X Interim Technical Report

Tze-Chieng Chung, Avi Feldblum, Alan G. MacDiarmid, and Alan J. Heeger 13 Jan. 1982 14 p refs Submitted for publication Sponsored in part by NSF
(Contract N00014-81-K-0648; NR Proj. 356-602)
(AD-A110618; TR-81-15) Avail: NTIS HC A02/MF A01 CSCL 07/4

Electrochemical isomerization of films of cis-(CH)x may be accomplished conveniently by first n-doping the (CH)x with (Bu4N)(+) to the metallic regime or p-doping the (CH)x with (ClO4)(-) to the metallic regime followed in each case by electrochemical undoping to yield pure trans-(CH)x.
Author (GRA)

N82-25350# Pittsburg Univ., Pa. Dept. of Chemistry.

LASER DESORPTION MASS SPECTROMETRY. 2: APPLICATIONS TO STRUCTURAL ANALYSIS Interim Technical Report

David M. Hercules, R. J. Day, K. Balasanmugam, Tuan A. Dang,

and C. P. Li 2 Feb. 1982 39 p refs
(Contract N00014-81-K-0408)
(AD-A110822; TR-1) Avail: NTIS HC A03/MF A01 CSCL 07/4

Laser desorption mass spectrometry (LDMS) is reviewed with focus on application to structural analysis of nonvolatile organic compounds. Models for the ionization-volatilization step are discussed with reference to solid-state vs. 'gas-phase' reactions. General characteristics of LDMS of organic compounds are discussed: for example, classes of compounds that generate M+ ions or (M+H)+ ions. Cationization reactions are considered; organic salts are discussed. Particular emphasis is placed on LDMS of high molecular weight compounds such as polysaccharides, polymers and vitamin B12 and its relatives. Problems of ion-molecule reactions complicating spectra are considered, particularly for transition metal coordination compounds. Other topics considered include quantitative analysis, microprobe applications and sample handling. Author (GRA)

N82-25351# University of Southern California, Los Angeles.
PREPARATION OF NITROCOMPOUNDS Final Research Report, 1 Nov. 1980 - 31 Oct. 1981
George A. Olah 15 Jan. 1982 5 p refs
(Contract DAAG29-81-K-0010)
(AD-A110804; ARO-17579.1-C) Avail: NTIS HC A02/MF A01 CSCL 07/3

Nitration of aromatics was studied with mixed 'fluoroacid' (i.e., FSO3H-HWO3), with transfer nitrating agent, such as N-nitropyrazole-BF3, and with Hg(++) impregnated Nafion-H catalyzed nitric acid under azeotropic water removal conditions. Both preparative and mechanic aspects were investigated. Author (GRA)

N82-25352# Washington Univ., Seattle. Dept. of Chemistry.
VIBRATIONAL ENERGY TRANSFER AND PYROLYSIS OF NITROMETHANE BY THE VARIABLE ENCOUNTER METHOD
W. Yuan, B. S. Rabinovitch, and R. Tosa 15 Jan. 1982 29 p refs Submitted for publication
(Contract N00014-75-C-0690; NR Proj. 092-549)
(AD-A110606; NR092-549-TR24) Avail: NTIS HC A03/MF A01 CSCL 07/4

The pyrolysis of nitromethane has been studied by the Variable Encounter Method (VEM) at temperatures from 816 K to 1092 K with two reactors of differing geometry having fused silica surfaces. The probability of reaction per collision with the reactor surface was measured. The down energy transition jump size, <delta E'>, was determined. It decreased with increasing wall temperature. A comparison is made of <delta E'> with previous results reported to date for other substrate molecules. Nitromethane is one of the more efficient energy transfer agents. However, in addition to the size (vibrational eigenstate density) and the polarity of the molecules, the nature of the hot surface seems also to play a role. Author (GRA)

N82-25353# Fluorochem, Inc., Azusa, Calif.
SYNTHESIS OF FLUORINATED ACETYLENES
Kurt Baum, Clifford D. Bedford, and Ronald J. Hunadi 1 Mar. 1982 34 p refs Submitted for publication
(Contract N00014-78-C-0520; NR Proj. 356-688)
(AD-A112059; TR-3) Avail: NTIS HC A03/MF A01 CSCL 07/3

New routes to fluorinated acetylenes were developed based on additions of iodofluorocarbons to silylacetylenes. Free radical addition of, -diiodo-perfluoroalkanes to trimethylsilylacetylene gave the iodotrimethylsilylolefins, Me3SiIC=Ch(CF2)nCH=CISiMe3, which reacted with potassium t-butoxide or DBU to give the trimethylsilylacetylenes, and with an excess of the base, the free diacetylenes. Perfluoroalkyl iodides similarly gave perfluoroalkyl acetylenes. Author (GRA)

N82-25354# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
SPECTROSCOPIC ANALYSIS OF PbO CHEMILUMINESCENCE M.S. Thesis
Dec. 1981 82 p refs
(AD-A111175; AFIT/GEP-PH/81D-9) Avail: NTIS HC A05/MF A01 CSCL 20/5

A lead oxide (PbO) flame was generated in a flow tube reactor by reacting lead vapor generated in a furnace with the oxidizers O2 and N2O. The emissions from the chemiluminescent flames were analyzed by means of a Jarrell Ash 0.25 m spectrograph and photomultiplier operating in the region 2000-8000 A. Rovibronic bands assignable to the x-a, x-b, x-A, x-B electronic systems were observed. The assignments compare well with published work. Spectra obtained with the two different oxidizers were compared. Significant differences in spectral line intensities were recorded. The pressure dependence of the intensities was also measured. Again, significant differences were recorded when the two different oxidizers were used. In the Pb + O2 reaction a low pressure enhancement of various lines was observed. Significant differences between the chemistry of these low pressure reactions and the chemistry of similar reaction of high pressure were observed. Author (GRA)

N82-25355# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
SODIUM CONCENTRATION MEASUREMENTS USING LASER INDUCED FLUORESCENCE M.S. Thesis
Vincent N. Benham Dec. 1981 37 p refs
(AD-A111138; AFIT/GEP/PH-81D-1) Avail: NTIS HC A03/MF A01 CSCL 07/4

An experimental system to detect small concentrations of atoms and molecules through the method of laser induced fluorescence is assembled and characterized. A tunable dye laser is used as the excitation source, and sodium is used as a test sample. Sodium is detected in concentrations down to 3790/cc. Author (GRA)

N82-25356# California Univ., Berkeley. Dept. of Chemistry.
METHYLENE SINGLET-TRIPLET ENERGY SPLITTING BY MOLECULAR BEAM PHOTODISSOCIATION OF KETENE
Carl C. Hayden, Daniel M. Neumark, Kosuke Shobatake, Randal K. Sparks, and Yuan T. Lee 19 Oct. 1981 37 p refs Submitted for publication
(Contract N00014-75-C-0671; Grant NSF CHE-79-16250; NR Proj. 092-549)
(AD-A111245) Avail: NTIS HC A03/MF A01 CSCL 20/7

The singlet-triplet splitting in methylene has been determined from the measurements of fragment velocities from ketene photodissociation at 351 and 308 nm in a molecular beam. The splitting is found to be 8.5 + or - 0.8 kcal/mole. This agrees with many experimental results, but not with the value of 19.5 kcal/mole derived from recent photodetachment experiments on CH2-. Author (GRA)

N82-25357# Central Research Inst. for Physics, Budapest (Hungary). Central Research Inst. for Physics.
RUTHERFORD BACKSCATTERING SPECTROMETRY
J. Gyulai Feb. 1981 37 p refs In ENGLISH; HUNGARIAN summary Submitted for publication
(KFKI-1981-08; ISSN-0368-5330; ISBN-963-371-785-X) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The bases of Rutherford ion backscattering and its combination with channeling effect technique are reviewed. This combined method is referred to as backscattering spectrometry. The measurement of chemical compositions, the detection of crystal defects, etc., are dealt with. Comparison with other surface analysis methods is also given. DOE

N82-25358# Central Research Inst. for Physics, Budapest (Hungary). Central Research Inst. for Physics.
RELATIVE SENSITIVITY COEFFICIENTS IN SPARK SOURCE MASS SPECTROMETRY (SSMS) OF METALS
I. Opauszky and I. Nyary Feb. 1981 14 p refs In ENGLISH; HUNGARIAN summary
(KFKI-1981-09; ISSN-0368-5330; ISBN-963-371-786-8) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Relative sensitivity coefficients (RSC) in aluminum, copper and iron using SSMS were determined with deep cooled electrodes. A straight line dependence was observed between log RSC and the boiling points of the impurities. The experimental results clearly indicate the importance of the relative heat of sublimation of the impurities. DOE

N82-25359# Oak Ridge Y-12 Plant, Tenn. Plant Lab. Dept.
INFRARED AND STRUCTURAL ANALYSES OF URANIUM OXIDATION PRODUCTS: PRELIMINARY RESULTS
E. L. Fuller, Jr., N. R. Smyrl, M. H. Eager, and J. B. Condon 14 Aug. 1981 60 p refs
(Contract W-7405-eng-26)
(DE82-000233; Y/DK-276) Avail: NTIS HC A04/MF A01

Water vapor oxidation of uranium follows a cyclic process: (1) rapid oxidation to form a thin dense, adherent layer of uranium dioxide, (2) slow diffusion of H2O and H2 through this oxide, until (3) a thickness of 0.2 to 0.3 nm is achieved in a strained state that (4) relaxes from the surface allowing further (1) contiguous oxide formation and finally (5) the shards of oxide comprised of oxide laminae spall completely free of the metal surface. The oxide thus formed is hydrated on the surface. Diffuse reflectance infrared Fourier transform spectroscopy shows that these are several distinct modes of water binding delineated with respect to energetics and reversibility. Scanning electron microscopy aids immensely in defining the nature of the laminae. Implications and suggestions for further work are given to aid in a better understanding of corrosion processes. DOE

N82-25360# Statens Provningsanstalt, Boraas (Sweden). Div. of Fire Technology.
NONCOMBUSTIBILITY ACCORDING TO INTERGOVERNMENTAL MARITIME CONSULTATIVE ORGANIZATION (IMCO) RES.A-270 (VIII). INTERLABORATORY TEST PROGRAM INITIATED BY IMCO
Bjoern Sundstroem 1980 42 p
(SP-RAPP-1981:10) Avail: NTIS HC A03/MF A01

Tests on mineral wool, glass wool, calcium silicate and mineral wool with surface lining of aluminum foil, following IMCO Res.A.270(8), ISO1182, and variations of these, are discussed. Temperature rise and flaming are considered. Temperature results show wide scatter. Values for the furnace temperature rise are distributed below the 50 deg limit, but test specimen rises are distributed on both sides of the limit. Complete agreement on classification is achieved for only one case. Flaming times for glass wool are better than those for mineral wool. Representing the data from final base temperatures, and stricter specification of test equipment and procedure is advocated. Author (ESA)

N82-25361# Statens Provningsanstalt, Boraas (Sweden). Div. of Fire Technology.
TEMPERATURE CALCULATION OF INSULATED STEEL COLUMNS EXPOSED TO NATURAL FIRE
Ulf Wickstroem 1981 27 p refs Submitted for publication
(SP-RAPP-1981:15) Avail: NTIS HC A03/MF A01

A method which allows approximate post flashover compartment fire temperature to be plotted versus time in one curve, the general natural fire curve, was developed. The time is modified to reflect ventilation conditions and wall properties. Standard assumptions as to constant and ventilation controlled combustion, uniform temperature, and wall losses proportional to the thermal inertia were made. The curve was used to calculate temperature in fire exposed insulated columns by a simple integration procedure. The results are plotted in diagrams. The theory is verified by plotting natural standard fire temperatures against modified times. Opening factor curves show little discrepancy. Author (ESA)

N82-25362# Statens Provningsanstalt, Boraas (Sweden). Div. of Fire Technology.
ISO IGNITABILITY TEST. ROUND ROBIN TEST RESULTS
Bjoern Sundstroem 1981 80 p refs
(SP-RAPP-1981:16) Avail: NTIS HC A05/MF A01

Common household materials, e.g., nylon carpet and expanded polystyrene, were tested according to ISO procedure. Glass reinforced polyester, hardboard, and PVC (rigid) were also tested with a 20 mm airgap behind the specimen. Ignition times are plotted against irradiance levels of 10, 20, 30, 40 and 50 kw/sq m. Problems occur with polystyrene: since it ignites only after melting, the ignitability of the solid was not determined. A change in the wrapping procedure is advocated, i.e., wrapping the sample and the already wrapped baseboard together with one sheet of aluminum foil and then cutting a hole in the foil. Author (ESA)

N82-25363# Statens Provningsanstalt, Boraas (Sweden). Div. of Fire Technology.
ISO SPREAD OF FLAME TEST. ROUND ROBIN TEST RESULTS
Inger Kaiser and Goeran Holmstedt 1981 27 p
(SP-RAPP-1981:17) Avail: NTIS HC A03/MF A01

Construction materials, e.g., plasterboard and rigid PVC, were subjected to flame spread tests. Their ability to produce a horizontal spread on a vertical surface after ignition by an 80 mm blue flame from a 6 mm diameter burner was examined. Ignition times, time taken to pass marks 50 to 800 mm from start, maximum distance travelled, time to temperature equilibrium after insertion of a dummy specimen, and extinction time where 800 mm is not reached are given. Author (ESA)

N82-25364# National Inst. for Metallurgy, Randburg (South Africa).
THE DIRECT DETERMINATION BY DIFFERENTIAL PULSE ANODIC-STRIPPING VOLTAMMETRY AT THE THIN MERCURY-FILM ELECTRODE OF CADMIUM, LEAD AND COPPER
A. F. Lee 21 Aug. 1981 45 p refs
(PB82-133125; NIM-2124; ISBN-0-86999-550-2) Avail: NTIS HC A03/MF A01 CSCL 07D

The development of a voltammetric procedure for the direct, simultaneous determination of cadmium, lead, and copper in three SAROC reference materials (carbonatite, magnesite, and quartz) is described. No interferences were encountered from Fe, As, Sb, Tl, or In at the concentrations present in the samples. Intermetallic interferences were eliminated by the use of thin mercury-film electrodes. Limits of detection are determined by the degree to which the supporting electrolyte could be purified, and are estimated to be 10 ng/g, 250 ng/g, and 150 ng/g for cadmium, lead, and copper respectively. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N82-25365# Council for Scientific and Industrial Research, Pretoria (South Africa).
STRUCTURAL AND PROPERTY CHANGES IN IRON-CARBON ALLOYS OBTAINED BY MEANS OF THERMO-CHEMICAL DIFFUSION TREATMENT IN CARBON, NITROGEN AND BORON-RELEASING MEDIA
D. Liedtke 1981 42 p refs Transl. into ENGLISH from Z. fuer Wirtschaftliche Fertigung (West Germany), v. 75, no. 1, 1980 p 33-48
(CSIR-Trans-1597) Avail: NTIS HC A03/MF A01

Particle precipitation and thermochemical diffusion are considered as methods of hardening solid solutions. The interaction of carbon, nitrogen, and boron with iron is described and the principle results of recarburizing and carbonitriding, followed by hardening, nitrogen treatment, nitrocarburizing, and boron treatment are considered. The effects of these processes on the principal service properties of metal components and tools made of these materials are examined. A.R.H.

N82-25366*# Northwestern Univ., Evanston, Ill. Dept. of Materials Science.
USE OF FROEHLICH-RAIMES AND OTHER ELECTRONIC MODELS FOR PHYSICAL PROPERTIES OF METALS AND ALLOYS
James T. Waber [1982] 74 p refs
(Grant NGR-14-007-131)
(NASA-CR-169001; NAS 1.26:169001) Avail: NTIS HC A04/MF A01 CSCL 11F

The effectiveness of the Froelich-Raimes model in treating force constants and alloy behavior is discussed. Typical predictions of trends include the deviation of Vegard's Law and the variation of the bulk modulus with pressure and with alloying elements. The simple model of Koskimaki and Waber using the linear combination of the density of states led to several useful predictions for titanium based alloys. Author

N82-25367*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Chemistry.
AN INVESTIGATION OF ADHESIVE/ADHEREND AND FIBER/MATRIX INTERACTIONS. PART A: SURFACE CHARACTERIZATION OF TITANIUM DIOXIDE, TITANTIUM AND TITANIUM 6% Al TO 4% V POWDERS: INTERACTION WITH WATER, HYDROGEN CHLORIDE AND POLYMERS Final Technical Report
Ranjani V. Siriwardane and J. P. Wightman May 1982 204 p refs
(Grant NAG1-127)
(NASA-CR-169009; NAS 1.26:169009) Avail: NTIS HC A10/MF A01 CSCL 11F

The titanium dioxide surface is discussed. Polymer adhesive are also discussed. Titanium powders are considered. Characterization techniques are also considered. Interactions with polymers, water vapor, and HCl are reported. Adsorbents are characterized. N.W.

N82-25368*# California Univ., Santa Barbara. Quantum Inst.
AN INVESTIGATION OF THE KINETICS OF HYDROGEN CHEMISORPTION ON IRON METAL SURFACES Final Report, Apr. 1977 - Mar. 1980
Mickey R. Shanabarger Apr. 1982 35 p refs
(Grant NsG-2222)
(NASA-CR-166327; NAS 1.26:166327) Avail: NTIS HC A03/MF A01 CSCL 11F

The isothermal kinetics of H2, H2S, and O2 chemisorption onto epitaxially grown (III) oriented Fe films were studied. The measurements were made using the techniques of chemisorption induced resistance change and Auger electron spectroscopy (for adsorbed sulfur and oxygen). Also the origin of the chemisorption induced resistance change for these systems and its applicability to kinetic measurements were established. The chemisorption kinetics were interpreted as dissociative chemisorption via an adsorbed molecular species. The applicable rate constants were established. In none of the studies were the rate constants observed to be coverage dependent. By comparing the temperature dependence of the rate constants with absolute rate theory, the binding energies and activation energies of all the kinetic processes were obtained for the H2/Fe system. The initial sticking coefficient was pressure dependent for both the H2/Fe and H2S/Fe systems. This results from the step between the adsorbed molecular state and the dissociated chemisorbed state being the rate limiting step for absorption at certain pressures and temperatures. Estimates were obtained for the temperature dependence of the rate constants for the O2/Fe system. M.G.

N82-25369*# Advanced Research and Applications Corp., Sunnyvale, Calif.
THE RELATIVE STRESS-CORROSION-CRACKING SUSCEPTIBILITY OF CANDIDATE ALUMINUM-LITHIUM ALLOYS FOR AEROSPACE STRUCTURAL APPLICATIONS Annual Report
Patrick P. Pizzo Sep. 1980 59 p refs
(Contract NAS2-10365)
(NASA-CR-166339; NAS 1.26:166339; TR-45-1) Avail: NTIS HC A04/MF A01 CSCL 11F

The microstructure and tensile properties of two powder metallurgy processed aluminum-lithium alloys were determined. Strength properties of 480 MPa yield and 550 MPa ultimate tensile strength with 5% strain to fracture were attained. Very little reduction in area was observed and fracture characteristics were brittle. The magnesium bearing alloy exhibited the highest strength and ductility, but fracture was intergranular. Recrystallization and grain growth, as well as coarse grain boundary precipitation, occurred in Alloy 2. The fracture morphology of the two alloys differed. Alloy 1 fractured along a plane of maximum shear stress, while Alloy 2 fractured along a plane of maximum tensile stress. It is found that a fixed orientation relationship exists between the shear fracture plane and the rolling direction which suggests that the PM alloys are strongly textured. E.A.K.

N82-25370*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE EFFECT OF WATER VAPOR ON FATIGUE CRACK GROWTH IN 7475-T651 ALUMINUM ALLOY PLATE
Dennis L. Dicus May 1982 34 p refs Presented at the Symp. on Environment-Sensitive Fracture: Evaluation and Comparison of Test Methods, Gaithersburg, Md., 26-28 Apr. 1982
(NASA-TM-84477; NAS 1.15:84477) Avail: NTIS HC A03/MF A01 CSCL 11F

The effects of water vapor on fatigue crack growth in 7475-T651 aluminum alloy plate at frequencies of 1 Hz and 10 Hz were investigated. Twenty-five mm thick compact specimens were subjected to constant amplitude fatigue testing at a load ratio of 0.2. Fatigue crack growth rates were calculated from effective crack lengths determined using a compliance method. Tests were conducted in hard vacuum and at water vapor partial pressures ranging from 94 Pa to 3.8 kPa. Fatigue crack growth rates were frequency insensitive under all environment conditions tested. For constant stress intensity factor ranges crack growth rate transitions occurred at low and high water vapor pressures. Crack growth rates at intermediate pressures were relatively constant and showed reasonable agreement with published data for two Al-Cu-Mg alloys. The existence of two crack growth rate transitions suggests either a change in rate controlling kinetics or a change in corrosion fatigue mechanism as a function of water vapor pressure. Reduced residual deformation and transverse cracking specimens tested in water vapor versus vacuum may be evidence of embrittlement within the plastic zone due to environmental interaction. S.L.

N82-25371# Massachusetts Inst. of Tech., Cambridge.
THE AGING AND TEMPERING OF IRON-NICKEL-CARBON-MARTENSITES Technical Report, Oct. 1980 - Sep. 1981
A. Sherman, G. T. Eldis, and Morris Cohen 31 Dec. 1981 41 p refs
(Contract N00014-81-K-0013)
(AD-A110657; TR-5) Avail: NTIS HC A03/MF A01 CSCL 11/6

The aging and tempering of freshly quenched and virgin martensites with lath and plate morphologies in Fe-Ni-C alloys were studied to obtain kinetic and structural information. At subambient temperature, the first change is attributed to isothermal conversion of a small amount of retained austenite or to slight relaxations in the martensite, but this is not a significant part of the martensite aging process. Aging above -40 C to about 70 C is accompanied by the diffusion controlled clustering of carbon atoms, resulting in an increase in electrical resistivity proportional to the carbon content but independent of the martensitic morphology. This regime is followed above 100 C by the precipitation of epsilon carbide (i.e., the conventional first stage of tempering), which may emerge directly from the carbon rich clusters. At still higher temperatures, cementite forms separately (i.e., the conventional third stage of tempering) in competition with the epsilon carbide. GRA

N82-25372# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
PROPERTIES OF SHOCK HARDENED 7050 ALUMINUM ALLOY
C. E. Neu 12 Nov. 1981 34 p refs
(AD-A110887; NADC-81251-60) Avail: NTIS HC A03/MF A01 CSCL 11/6

Work has shown that improvements in both strength and ductility of nickel-base alloys can be achieved by shockwave deformation (shock hardening). Such deformation is produced by impact of a driver plate on a flat sample. The driver plate is driven by an explosive pressure pulse. Specifically, the University of Denver work showed shock-aging Udimet 700 sheet at 527 kbar pressure could lead to ductility increases of 200 to 400%, together with substantial increases in strength at both room temperature and 649 C (1200 F). Stress rupture life at 649 C (1200 F) could be increased as high as 50-fold. This report contains the results of an attempt to achieve similar improvements in mechanical properties of 7050 aluminum alloy plate by shock hardening. Shock hardening produced no significant change in the tensile or fatigue properties of the 7050 plate. Exfoliation resistance was also found to be unchanged. Shock hardening of 7050-T73651 aluminum plate produces no significant change in its properties. GRA

N82-25373# United Technologies Research Center, East Hartford, Conn.

FABRICATION OF THIN WALL CYLINDRICAL SHELLS BY SPUTTERING Final Technical Report, 4 Aug. 1978 - 4 Aug. 1980

E. L. Paradis 30 Nov. 1981 73 p
(Contract N00019-78-C-0502)
(AD-A111649; UTRC/R80-924394-8) Avail: NTIS HC A04/MF A01 CSCL 13/8

This report describes the process used to fabricate thin wall cylindrical shells by sputtering. The shells are grown on both sacrificial aluminum and reuseable stainless steel mandrels. The post deposition process used to remove the shells from the mandrels is described. The effect of deposition conditions and post deposition treatment on crystallographic structure is presented. Comparisons of sputtered shells are made with conventionally machined ones as pertains to dimensional uniformity and performance. Test results of sputtered thin wall cylindrical shells used as pressure sensing elements are given. GRA

N82-25374# Universidad Complutense, Madrid (Spain). Dept. de Metalurgia.

THE EFFECT OF SIMULATED WELDING CONDITIONS ON AUSTENITE DECOMPOSITION KINETICS Final Report, May 1981

F. A. Calvo, B. G. Mellor, and A. J. Criado Jul. 1981 58 p refs
(Contract DAJA37-80-C-0298; DA Proj. 1T1-61102-BH-57)
(AD-A111189) Avail: NTIS HC A04/MF A01 CSCL 07/4

The polished surface technique weld simulator was used to obtain quantitative information on the phase transformations taking place in the weld heat affected zone (HAZ) of a Fe-0.6C steel. The progress of the ferrite to austenite and austenite to pearlite transformations were determined by quantitative metallography and related to the thermal history, as measured by microthermocouples, throughout the specimen. The alpha yields gamma transformation is observed to be complete at 780 C under a heating of 50 C/s while the pearlite in the HAZ coarsens and dissolves to form an austenite initially inhomogeneous; both these processes initiate at internal 'faults' in the pearlite colonies. On cooling a pearlite type morphology with an interlamellar spacing not resolved by optical microscopy is formed from this austenite. By comparing the weld simulator and continuous cooling transformation data it was concluded that inhomogeneous austenite favors the nucleation of a non-conventional pearlite. GRA

N82-25375# Massachusetts Inst. of Tech., Cambridge.

STRENGTH OF INITIALLY VIRGIN MARTENSITES AT -196 C AFTER AGING AND TEMPERING Technical Report, Oct. 1980 - Sep. 1981

George T. Eldis (Climax Molybdenum Co.) and Morris Cohen 31 Dec. 1981 30 p refs Submitted for publication
(Contract N00014-81-K-0013)
(AD-A110656; TR-6) Avail: NTIS HC A03/MF A01 CSCL 11/6

The compressive strength at -196 C of martensites in Fe-0.26%C-24%Ni, Fe-04%C-21%Ni, and Fe-0.4%C-18%Ni-3%Mo alloys, all with sub zero M sub s temperatures, was determined in the virgin condition and after one hour at temperatures from -80 to +400 C. The effects of ausforming (20% reduction in area of the austenite by swaging at room temperature prior to the martensitic transformation) were also investigated. For the unausformed martensites, aging at temperatures up to 0 C results in relatively small increases in strength. Above 0 C, the age hardening increment increases rapidly, reaching a maximum at 100 C during the carbon clustering stage and prior to the precipitation of carbides. Above C, the strength decreases continuously with increasing tempering temperature except for the molybdenum containing alloy, which exhibits secondary hardening on tempering at 400 C. For the measurement martensites, the response to aging at sub zero temperatures is greater than for unausformed material. Strength again passes through a maximum on aging at 100 C. GRA

N82-25376# American Univ., Washington, D. C. Dept. of Chemistry.

LOCALIZED ELECTROCHEMICAL CORROSION CELLS Final Report, 1 Sep. 1978 - 28 Feb. 1981

R. T. Foley Feb. 1982 19 p refs
(Contract DAAG29-80-C-0148; Grant DAAG29-78-G-0165)
(AD-A111591; ARO-15539.7-MS) Avail: NTIS HC A02/MF A01 CSCL 09/1

The objective of this research has been to characterize the chemical and electrochemical nature of the localized corrosion cell on aluminum alloys and to relate the environment to the rate of stress cracking of AA7075. It was demonstrated that the environment, as represented by various anions in solution enters into the stress cracking process in a specific way. The reaction at the crack tip is chemical in nature. There are significant changes in pH and Al(3+) concentration within the crack. These changes have been measured and are dependent on the anion in solution as well as the applied potential. The environment within the crack may be altered as well as concentrated, e.g., nitrate ion may be reduced to ammonia during the cracking process. The low pH - of approximately 3 - is explained by the hydrolysis of the aluminum ion, but it is not the hydrolysis, per se, that is responsible for the accelerated corrosion, because the corrosion rate of aluminum in different salts at the same pH is significantly different. All of the studies taken together convincingly demonstrate that chemical reactions at the crack tip determine the rate of crack growth in AA7075. GRA

N82-25377# Naval Postgraduate School, Monterey, Calif. Dept. of Mechanical Engineering.

A PRELIMINARY INVESTIGATION OF THE CORROSION STRESS-CORROSION SUSCEPTIBILITY OF THERMOMECHANICALLY PROCESSED HIGH MAGNESIUM, ALUMINUM MAGNESIUM ALLOYS M.S. Thesis

Larry Edward Beberdick Sep. 1981 85 p refs
(AD-A110563) Avail: NTIS HC A05/MF A01 CSCL 11/6

The stress corrosion cracking susceptibility and general corrosion characteristics of four thermomechanically processed high-Magnesium, Aluminum-Magnesium alloys were evaluated and compared to those of 7076-T6. Results obtained from stress-corrosion testing and from tension testing after stress-corrosion exposure indicate that these 8-10% Mg alloys are less susceptible to stress-corrosion cracking than 7075-T6. The addition of Cu or Cu and Mn to a 10% Mg alloy raises strength, homogenizes the microstructure and reduces the tendency of such an alloy to exhibit intergranular cracking and exfoliation, especially in a sensitized condition. Results of accelerated general corrosion testing and marine exposure both indicate that binary 8% Mg and 10% Mg alloys are highly resistant to corrosion. Alloying with Cu or Cu and Mn accelerates weight loss but to a lesser degree than observed for 7075-T6. Author (GRA)

N82-25378# Naval Postgraduate School, Monterey, Calif. Dept. of Mechanical Engineering.

STUDIES OF THE LOW TEMPERATURE HOT CORROSION OF UNCOATED SUPERALLOYS M.S. Thesis

Garry D. Newberry Sep. 1981 45 p refs
(AD-A110992) Avail: NTIS HC A03/MF A01 CSCL 11/6

Several nickel-based superalloys used in the manufacture of gas turbine hot section components were investigated to determine potential alloying element effects on the uncoated alloy's resistance to low temperature hot corrosion (LTHC). In addition, the nickel-based alloy IN 738 was modified with one and two percent concentrations of hafnium to evaluate the effect of this active element on LTHC resistance. The alloys were ranked into groups of good, moderate or poor, regarding their resistance to LTHC. Relatively high chromium contents were found to be beneficial while relatively high contents of cobalt were unexpectedly determined to be detrimental. The LTHC resistance of IN 738 was improved by small additions of hafnium. This program also showed that the Naval Postgraduate School hot corrosion furnace reproduced the corrosion patterns seen on uncoated alloys in burner rigs and industrial gas turbines. Author (GRA)

N82-25379# Japan Atomic Energy Research Inst., Tokyo. Div. of Nuclear Fuel Research.

DUCTILITY LOSS NEUTRON-IRRADIATED HASTELLOY-X AT ELEVATED TEMPERATURES

Katsutoshi Watanabe, Yutaka Ogawa, Masahiko Kikuchi, and Tatsuo Kondo Apr. 1980 16 p refs In JAPANESE; ENGLISH summary
(JAERI-M-8807) Avail: NTIS (US Sales Only) HC A02/MF A01;

DOE Depository Libraries

In addition to the B-10(n,alpha)Li-7 reaction, the contribution of helium generation due to the two-step reaction Ni-58(n,gamma) Ni-59(n,alpha)Fe-56 at higher fluences was considered. Irradiations were made mostly at 600 C, followed by high-temperature tensile tests. The post-irradiation ductility generally decreased with temperature increase up to 10000 C. Extrapolations of the results of irradiation at 600 C gave the apparent fracture ductility values of 3.5% at 9000 C and 1.5% at 10000 C. Threshold thermal neutron fluences for the ductility loss were also predicted as 6 x 10 (to the 16th power n/sq cm) at 9000 C and 10000 C, respectively. Ductility loss was increased when the irradiation was made at temperatures equivalent to the tensile test conditions. Hastelloy-X as a control rod sheath material in high temperature gas-cooled reactor is discussed. DOE

N82-25380# Japan Atomic Energy Research Inst., Tokyo. Div. of Nuclear Fuel Research.

OPTIMIZATION IN Si CONTENT OF HASTELLOY XR FOR OXIDATION RESISTANCE AND OXIDE FILM ADHERENCE DURING OXIDATION IN VHTR HELIUM

Masami Shindo and Tatsuo Kondo Apr. 1980 14 p refs In JAPANESE; ENGLISH summary

(JAERI-M-8835) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The oxidation behavior of several heats of modified Hastelloy alloy X, named Hastelloy XR, with different Si contents was examined in isothermal, thermal cycling exposure tests. The test environment was flowing helium at 10000 C containing controlled amounts of impurities simulating the very high temperature gas-cooled reactor coolant. Tests were made to determine an optimization range of Si content for obtaining higher resistance to the oxidation and less oxide spallation in the service environment. Up to 1% content, increase of the Si caused decrease of the oxidation rate, while the oxide spallation in thermal cycling was a minimum in the range of about 0.2 to 0.4% Si. These two could be explained in formation and morphology of the SiO2 phase in the oxide and metal interface by metallographic observation and analysis. DOE

N82-25381# General Electric Co., St. Petersburg, Fla. Component Development Engineering Dept.

GAS-LEAK PATHS IN STAINLESS STEEL

K. B. Bruckart Sep. 1981 9 p

(Contract DE-AC04-76DP-00656)

(DE82-001203; GEPP-TIS-613) Avail: NTIS HC A02/MF A01

Leak paths through a stainless steel plate into a vacuum chamber were due to the reduction of metal sulfides during a brazing operation and the combining of the sulfur with hydrogen to form hydrogen sulfide gas. This gas escapes from the metal, leaving openings, or paths, for leaks. With proper orientation of these paths to the surface exposed to vacuum, the leaks can be eliminated. DOE

N82-25382# Japan Atomic Energy Research Inst., Tokyo. Div. of High Temperature Engineering.

EMBRITTLEMENT OF NORMALIZED AND TEMPERED 2.25Cr-1Mo STEEL BY THE TEMPER EMBRITTLEMENT UNDER STRESS

Masahide Suzuki, Kiyoshi Fukaya, Toshihiko Kikuyama, and Tatsuo Oku Oct. 1980 34 p refs In JAPANESE; ENGLISH summary

(DE81-700043; JAERI-M-9150) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

Due to the temper embrittlement, 2 1/4Cr-1Mo steel, normalized and tempered, becomes brittled in the temperature range of 400 - 550 C, although the material is one of the promising candidates for the Experimental Very High Temperature Gas Cooled Reactor (VHTR) pressure vessel. The effect of tensile stress on the temper embrittlement was examined for the normalized and tempered 2 1/4Cr-1Mo steel. The results of Charpy impact tests indicated that the embrittlement, which was assessed in terms of 50 ft-1bf level transition temperature, became more pronounced with increase in the applied stress level. Scanning electron microscopic observations revealed that the increase in transition temperature was accompanied by the increase of intergranular fracture. Segregation of phosphorus at grain boundaries was found by Auger electron microscopy. These results suggest that the segregation of phosphorus at grain boundaries was accelerated by the applied tests. DOE

N82-25383# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.

MECHANICAL PROPERTIES OF HOT ISOSTATIC PRESSED P/M-TITANIUM FOR HELICOPTER COMPONENTS

Wolfgang Keinath and Marko Tapavicza 1981 31 p refs Presented at 7th European Rotorcraft and Powered Lift Aircraft Forum, Garmisch-Partenkirchen, West Germany, 8-11 Sep. 1981; sponsored by DGLR

(MBB-UD-324-81-O) Avail: NTIS HC A03/MF A01

The production of titanium alloy (Ti6Al4V) aircraft components was investigated. Powder metallurgy (P/M) manufacturing processes that involve hot isostatic pressing (HIP) and investment casting were characterized. The microstructure of P/M HIP Ti6Al4V bar and plate specimens is depicted. Mechanical properties were determined by static tensile and fatigue testing and a modified Goodman diagram was derived. Mechanical properties are the same as those of the corresponding wrought alloy. Static and dynamic values for a P/M HIP Ti6Al4V blade fitting were also found from results of helicopter rotor hub component tests. Analysis shows that the blade fitting fulfills strength requirements. Reduction in machining as well as raw material weight savings when manufacturing P/M HIP components are pointed out. Author (ESA)

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N82-25384*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

ELASTOMER TOUGHENED POLYIMIDE ADHESIVES Patent Application

Anne K. St.Clair and Terry L. St.Clair, inventors (to NASA) Filed 2 Oct. 1981 14 p

(NASA-Case-LAR-12775-1; US-Patent-Appl-SN-308201) Avail: NTIS HC A02/MF A01 CSCL 07C

A rubber-toughened addition type polyimide composition having excellent high temperature bonding characteristics in the fully cured state and improved peel strength and adhesive fracture resistance is discussed. The process for making the improved adhesive involves preparing the rubber containing amic acid prepolymer by chemically reacting an amine-terminated elastomer and an aromatic diamine with an aromatic dianhydride with which a reactive chain stopper anhydride has been mixed, and utilizing a solvent or mixture of solvents for the reaction. NASA

N82-25385*# IIT Research Inst., Chicago, Ill.

INVESTIGATION OF DEGRADATION MECHANISMS IN COMPOSITE MATRICES Final Report, 25 Jul. 1978 - 25 Mar. 1980

C. Giori and T. Yamauchi Washington NASA Jun. 1982 111 p

(Contract NAS1-15469)

(NASA-CR-3559; NAS 1.26:3559; C06428-17) Avail: NTIS HC A06/MF A01 CSCL 11D

Degradation mechanisms were investigated for graphite/polysulfone and graphite/epoxy laminates exposed to ultraviolet and high-energy electron radiations in vacuum up to 960 equivalent sun hours and 10 to the ninth power rads respectively. Based on GC and combined GC/MS analysis of volatile by-products evolved during irradiation, several free radical mechanisms of composite degradation were identified. The radiation resistance of different matrices was compared in terms of G values and quantum yields for gas formation. All the composite materials evaluated show high electron radiation stability and relatively low ultraviolet stability as indicated by low G values and high quantum for gas formation. Mechanical property measurements of irradiated samples did not reveal significant changes, with the possible exception of UV exposed polysulfone laminates. Hydrogen and methane were identified

as the main by-products of irradiation, along with unexpectedly high levels of CO and CO2. Author

N82-25386*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Lab. of Polymer Materials and Interfaces.
POLY(ARYL ETHERS) AND RELATED POLYSILOXANE COPOLYMER MOLECULAR COATINGS: PREPARATION AND RADIATION DEGRADATION Final Report
James E. McGrath 20 May 1982 27 p refs
(Grant NAG1-106)
(NASA-CR-169000; NAS 1.26:169000) Avail: NTIS HC A03/MF A01 CSCL 11G

The radiation degradation of poly(arylene ether sulfones) and related materials is studied. These basic studies are important both as a means to developing stronger, more stable matrix resins for composite materials, as well as to improve the data base in regard to chemical structure-physical property relationships. Thirty homo and copolymers were synthesized, at least partially characterized and, in several cases suitable film casting techniques were developed. Four samples were chosen for initial radiation degradation. Poly(dimethyl siloxane) soft bocks/segments can preferentially migrate to the surface of copolymer films. Since siloxanes are utilized as thermal control coatings, this form of 'molecular' coating is of interest. The chemistry for preparing such copolymers with any of the polymers described was demonstrated. S.L.

N82-25387# Stanford Univ., Calif. Lab. of Physics.
ELASTIC DOMAIN WALL WAVES IN FERROELECTRIC CERAMICS AND SINGLE CRYSTALS Annual Progress Report, 1 Feb. 1981 - 31 Jan. 1982
B. A. Auld Jan. 1982 37 p refs
(Contract N00014-79-C-0222)
(AD-A110839; GL-3381) Avail: NTIS HC A03/MF A01 CSCL 20/2

We have successfully launched and detected guided acoustic interface waves in both simulated domain wall structures and actual differentially poled ceramics. A heterodyne laser probe has been used to measure the acoustic field distributions associated with these waves. Remanent polarization and strain measurements have also been performed on differentially poled ceramic specimens. Composite resonators and interface waveguides are being characterized by laser probe techniques.
Author (GRA)

N82-25388# Pennsylvania State Univ., University Park. Dept. of Chemistry.
THE SYNTHESIS AND STRUCTURE OF POLYPHOSPHAZENES Final Report, 1 Sep. 1978 - 9 Nov. 1981
Harry R. Allcock 16 Feb. 1982 5 p refs
(Grant DAAG29-78-G-0190; DA Proj. 1L1-61102-BH-57)
(AD-A111659; TR-6; ARO-15783.10-C) Avail: NTIS HC A02/MF A01 CSCL 11/9

New synthetic methods have been developed for the preparation of polyphosphazenes that contain transition metals as part of the side group structure. Short chain phosphazenes have also been investigated as models for the high polymers.
Author (GRA)

N82-25389# Pittsburg Univ., Pa. Dept. of Mechanical Engineering.
MECHANICAL SPECTROSCOPY FOR EPOXY RESINS Final Report, 26 Sep. 1977 - 2 Jan. 1981
M. L. Williams, N. H. Wackenhut, R. D. Marangoni, N. R. Basavanhally, E. F. M. Winter, and C. C. Yates Wright-Patterson AFB, Ohio AFWAL Aug. 1981 138 p refs
(Contract F33615-77-C-5232; AF Proj. 2419)
(AD-A111397; SETEC-ME-81-035; AFWAL-TR-81-4070) Avail: NTIS HC A07/MF A01 CSCL 11/9

Mechanical characteristics of ten variations of Hercules 3501-5A epoxy resin have been determined to relate their behavior. Tensile properties, failure properties, viscoelastic properties and some physiochemical properties have been investigated. A dilatometer has been developed under this program for the study of cure kinetics. GRA

N82-25390# Westinghouse Research and Development Center, Pittsburgh, Pa. Ceramics and Glasses Dept.
FORMATION OF MONOLITHIC OXIDE MATERIALS BY CHEMICAL POLYMERIZATION Final Report, 29 Jan. 1980 - 19 Jan. 1982
B. E. Yoldas and D. P. Partlow 14 Jan. 1982 36 p refs
(Contract DAAG29-80-C-0095)
(AD-A111607; ARO-16824.1-MS) Avail: NTIS HC A03/MF A01 CSCL 07/3

Hydrolysis of metal alkoxides results in the formation of polymer molecules with oxide main chains framed by hydroxyl and organic groups. The skeleton of the main structural chains in these polymer molecules is generally analogous to the skeleton of fused silica and quartz. However the method of hydrolysis affects the nature and extent of the oxide network. Thus changes in the hydrolysis process alter many of the fundamental properties of the gel which are reflected in its general behavior, as well as the oxide materials derived from the gel. One of the critical factors affected by the method of hydrolysis is the capability of the gel to remain monolithic through pyrolysis. This report presents an investigation of various parameters involved in the formation of inorganic polymers from metal alkoxides and the structures of these oxide materials. Author (GRA)

N82-25391# Battelle Columbus Labs., Ohio.
PROCESS DEVELOPMENT AND PROPERTY EVALUATION OF ORGANOSILICON INFILTRATED REACTION SINTERED SILICON NITRIDE (RSSN) Final Report, Jun. 1980 - Sep. 1981
R. R. Wills, R. A. Markle, and W. E. Hauth Wright-Patterson AFB, Ohio AFWAL Jan. 1982 96 p refs
(Contract F33615-80-C-5007; AF Proj. 2420)
(AD-A111461; AFWAL-TR-81-4164) Avail: NTIS HC A05/MF A01 CSCL 08/3

The porous nature of RSSN limits its performance as a structural material because the pores act as strength limiting flaws and facilitate internal oxidation. The objective of this program was to develop an impregnation and pyrolysis process to fill these pores with silicon carbide and/or nitride derived from organosilicon precursors. Seven organosilicon precursors were evaluated as infiltrants using reaction bonded silicon nitride (RSSN) ceramics of different densities. Methylsilazane in decalin solvent was the best infiltrant. Pyrolysis of methylsilazane resulted in a fine-grained microstructure containing 1 micron closed pores. This grainy deposit bonded well to the pore walls in RSSN, and for this reason the methylsilazane is considered to be the best candidate organosilicon for improving the properties of RSSN. During pyrolysis all organosilicon precursors exhibit a considerable volume of shrinkage and weight loss causing residual surface material to flake off the RSSN surface. Thin coatings were applied to RSSN samples to effectively plug the surface porosity. This resulted in significant improvements in oxidation resistance in both high and medium density RSSN materials. A 70% increase in the strength of low density foam RSSN was obtained.
Author (GRA)

N82-25392# McDonnell-Douglas Research Labs., St. Louis, Mo.
AGING OF POLYMERS AND COMPOSITES Final Report, 21 Apr. 1980 - 21 Jul. 1981
C. J. Wolf, D. L. Fanter, and M. A. Grayson 21 Jul. 1981 72 p refs
(Contract N00019-80-C-0102)
(AD-A111625; MDC-Q0743) Avail: NTIS HC A04/MF A01 CSCL 11/9

The microchemical changes produced during the aging of the resin system, MY720 (Ciba-Geigy) cured with Eporal (Ciba-Geigy), were studied by the combined use of chemiluminescence, vaporization gas chromatography (and mass spectrometry), precision abrasion mass spectrometry, and stress mass spectrometry. Resin coupons were aged at ambient, 85 C and 150 C in dry and moist atmospheres in the presence and absence of an external tensile stress (up to 50% of the ultimate tensile stress). The chemiluminescence peak intensity which occurs at a temperature change was found to be an inverse function of the aging time for a given set of environmental parameters. Propenal, a low-temperature decomposition product of the resin, may be related to the chemiluminescence and aging processes.
GRA

N82-25393# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Macromolecular Science.
STRUCTURE DETERMINATION OF THE MACROMONOMER POLY (1,11 - DODECADIYNE) AND ITS CROSS-POLYMERIZED PRODUCT Technical Report, 1 Mar. 1981 - 27 Jun. 1982
Jerome B. Lando and M. Thakur 27 Jun. 1982 25 p refs (Contract N00014-77-C-0213)
(AD-A111661; TR-5) Avail: NTIS HC A02/MF A01 CSCL 11/9

Electron diffraction patterns were obtained from the macromonomer and cross-polymerized crystals of Poly(1,11 Dodecadiyne). The macromonomer was cast in thin (< 200 A(films from chloroform solution. Crosspolymerization resulted from subsequent exposure of these samples to Co60 - gamma radiation. Two orientations of the crosspolymerized crystals were obtained by varying the evaporation rate of solvent in the original macromonomer diposition. Thirty-six reflections for the crosspolymerized sample and eighteen reflections for the macromonomer were obtained. Refinement of the structures was accomplished with these data. The unit cell of both macromonomer and cross-polymerized material was monoclinic, space group P2 sub 1 1n. GRA

N82-25771# Joint Publications Research Service, Arlington, Va.
HYGIENIC EVALUATION OF NEW TYPES OF RUBBER TO BE USED IN WATER SUPPLY SYSTEMS EXPOSED TO HIGH TEMPERATURES AND ACTIVE CHEMICALS
N. I. Omelyanets, V. I. Lashkareva, N. N. Shabatura, and I. S. Kucherov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 102-107 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 70-73 (For primary document see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N82-25394*# National Aeronautics and Space Administration. Pasadena Office, Calif.
AUTOCATALYTIC COAL LIQUEFACTION PROCESS Patent Application
Shaik A. Qader, Principal Investigator (JPL, California Inst. of Technology, Pasadena) Filed 3 Jan. 1980 32 p Sponsored by NASA
(NASA-Case-NPO-14876-2; US-Patent-Appl-SN-285194) Avail: NTIS HC A03/MF A01 CSCL 21D

An improved process for liquefying coal in which coal minerals at high content are utilized as hydrocracking catalysts is described. A slurry of 10 to 60% by weight of coal in a recycled liquefied coal product containing 15 to 30% by weight of coal minerals is pressurized with excess hydrogen to a pressure of 2,000 to 4,000 psi and heated to a temperature of 450 to 550 degrees C. The coal minerals autocatalytically convert coal solids to a low viscosity liquid product and to a gas product in high yields while reducing oxygen, nitrogen, and sulfur content of the coal product as compared to other coal liquefaction processes under development. NASA

N82-25395# Goettingen Univ. (West Germany). Inst. of Physical Chemistry.
INFLUENCE OF VARIOUS PARAMETERS ON INITIATION, STABILITY AND LIMITS OF DETONATIONS Final Scientific Report, 1 Sep. 1979 -31 Dec. 1981
W. Jost and H. Gg. Wagner 31 Dec. 1981 29 p
(Grant AF-AFOSR-0117-79; AF Proj. 2308)
(AD-A111088; AFOSR-82-0021TR) Avail: NTIS HC A03/MF A01 CSCL 19/1

The influence of a sequence of orifices on the propagation of flames in tubes has been investigated by measuring stationary flame speeds and pressure profiles. Flame propagation speeds of more than 600 m/s, confirming Wheeler's results, could be measured. Maximum pressures reached values markedly above the isochoric explosion pressure. The mechanism is discussed. Author (GRA)

N82-25396# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
AN ECONOMIC MODEL OF FUTURE COAL/DENSIFIED REFUSE-DERIVED FUEL USE AT WRIGHT-PATTERSON AFB, OHIO M.S. Thesis
Richard G. Fedors Sep. 1981 184 p refs
(AD-A111376; AFIT-LSSR-97-81) Avail: NTIS HC A09/MF A01 CSCL 13/1

A thirty-month evaluation/demonstration of densified refuse-derived fuel (dRDF) as a stoker boiler fuel in military heating plants was performed. The impact on plant operating expenses of burning coal dRDF mixtures at that particular base is examined. The figures for comparison were generated by a simulation model of the base heating system and environment. Projected yearly operating expenses were accumulated in the model and returned to present values for various fuel ratios, inflation rates, and discount factors. Under the assumptions made within the model, coal alone will remain less expensive to use than a mixture of dRDF until a local source of dRDF becomes available. J.D.

N82-25397# Clemson Univ., S.C. Dept. of Mechanical Engineering.
ANALYTICAL INVESTIGATION OF HIGH PERFORMANCE, SHORT, THRUST AUGMENTING EJECTORS Theoretical Phase Report, Apr. 1980 - Apr. 1981
Tah-teh Yang and Francois Ntone 4 Jan. 1982 70 p refs
(Contract N00167-80-C-0040)
(AD-A111278; AERO/1274/CU-ME-F-1-81; DTNSRDC/ASED-CR-1-82) Avail: NTIS HC A04/MF A01 CSCL 20/4

A procedure for analyzing thrust augmenting ejectors having a short, curved-wall diffuser is presented. In this type of diffuser a shear flow is admitted at the inlet and a set of auxiliary ejectors is used to provide the necessary boundary layer control. Several computer programs are used in the analytical procedure. These computer programs are either outlined or referenced in the open literature. A user's manual is provided in the Appendices of this report. A discussion of the geometries and performances, including thrust augmentation ratios, of two sample ejectors determined by use of this analytical procedure with mixing chamber contraction as an optimization parameter is presented. Use of the mixing chamber length as an optimization parameter is also discussed. Author (GRA)

N82-25398# Army Armament Research and Development Command, Dover, N. J. Large Caliber Weapon Systems Lab.
CONCEPTS OF IDEAL AND NONIDEAL EXPLOSIVES
O. Sandus Dec. 1981 25 p refs
(AD-A111302; AD-E400753; ARLCD-TR-81042) Avail: NTIS HC A02/MF A01 CSCL 19/1

The purpose of this report is to stimulate discussion on the nonideality of ammonium nitrate and its composite explosives. The concept of ideal and nonideal explosives is explored, which leads to a discussion of the relationship between theory and experiment of the diameter effect. The behavior of some nonideal explosives is considered, and it is suggested that these explosives may tend to be ideal at large diameters. For composites containing nonideal explosives, the trend in approaching ideal behavior may be due, in part, to the lowering of the large diameter requirement by the small particle size and the relatively low effective density of the nonideal explosive in the composite. GRA

N82-25399# General Technology Applications, Inc., Arlington, Va.
INVESTIGATION OF THE APPLICATION OF A CRYOGENIC BLENDING PROCESS TO PRODUCE ANTIMISTING DIESEL FUELS Final Report
Albert F. Hadermann, Paul Waters, Jerry C. Trippe, and William Weitzen 15 Jan. 1982 65 p refs
(Contract DAAK70-81-C-0134)

(AD-A110917; GTA-A-001) Avail: NTIS HC A04/MF A01 CSCL 21/4

Fire-resistant fuels have been investigated by the United States Army as a means of reducing the risk of fire in land combat vehicles and certain aircraft. One approach has been the use of high-molecular-weight polymer additives for suppression of mist formations. The polymers which are effective in mist suppression are very difficult to dissolve in fuel. A newly discovered process for dissolving high-molecular-weight polymers is investigated to determine its applicability to the preparation of mist suppression fuels. The conclusions area that certain high-molecular-weight polymers which show strong mist suppression behavior can be dissolved rapidly in diesel fuel and that the new dissolving process appears to be adaptable to field use.
Author (GRA)

N82-25400# Environmental Protection Agency, Ann Arbor, Mich. Control Technology Assessment and Characterization Branch.
CURRENT STATUS OF EPA OFFICE OF MOBILE SOURCE AIR POLLUTION CONTROL CHARACTERIZATION PROJECTS: SUMMARY
Thomas M. Baines Aug. 1981 68 p refs
(PB82-105909; EPA-AA-CTAB-PA-81-18) Avail: NTIS HC A04/MF A01 CSCL 21D

EPA-OMSAPC is conducting a thorough characterization of unregulated emissions on a variety of current and prototype engines. Extensive work is also underway to see how various fuel parameters affect regulated and unregulated emissions. This latter work includes projects on alternate fuels such as methanol as well as fuels derived from coal or oil shale. GRA

N82-26174# Indian Space Research Organization, Trivandrum. Chemicals and Materials Group.
A DIRECT RANDOM SEARCH TECHNIQUE FOR THE OPTIMIZATION OF PROPELLANT SYSTEMS
V. Swaminathan and N. S. Madhavan *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 101-104 refs (For primary document see N82-26161 16-99)
Avail: NTIS HC A08/MF A01

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N82-25401*# National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD AND APPARATUS FOR PRODUCING CONCENTRIC HOLLOW SPHERES Patent Application
Taylor G. Wang (JPL, California Inst. of Tech., Pasadena) and Daniel D. Elleman, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 17 Jul. 1981 15 p
(Contract NAS7-100)
(NASA-Case-NPO-14596-2; NASA-Case-NPO-14603-4; US-Patent-Appl-SN-284313) Avail: NTIS HC A02/MF A01 CSCL 13H

Hollow spheres with precisely concentric inner and outer spherical surfaces are formed by applying vibrations to a nonconcentric hollow sphere while it is at an elevated temperature at which it is fluid or plastic, the vibrations producing internal flos which cause the inner and outer surfaces to become precisely concentric. Concentric spheres can be mass produced by extruding a material such as glass or metal while injecting a stream of gas into the center of the extrusion to form a gas filled tube. Vibration are applied to the extruded tube to help break to form spherical inner and outer surfaces by reason of surface tension, and the continuing application of vibrations causing these surfaces to become concentric. NASA

N82-25402# Naval Research Lab., Washington, D. C.
EVALUATION OF THREE PERCENT AQUEOUS FILM FORMING FOAM (AFFF) CONCENTRATES AS FIRE FIGHTING AGENTS Final Report, Sep. 1978 - Nov. 1980
Edwin J. Jablonski Tyndall AFB, Fla. Air Force Engineering and Services Center. Apr. 1981 45 p refs
(AF Proj. 2505)
(AD-A110821; AFESC/ESL-TR-81-18) Avail: NTIS HC A03/MF A01 CSCL 13/12

A large-scale fire test program involving 20,000-square foot JP-4 fuel fires was conducted to evaluate the fire suppression effectiveness and compatibility of 3 percent Aqueous Film Forming Foam (AFFF) agents in Air Force fire fighting vehicles. Three commercially available 3 percent AFFF concentrates were tested in accordance with military specification MIL-F-24385B. Test results are summarized in Appendix A. As a result of these tests, an updated Revision C to this MIL SPEC has been accomplished with new requirements for both 3 percent and 6 percent AFFF extinguishing agents. Author (GRA)

N82-25403# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
AUTOMATED DRAFTING AND DESIGN FOR THE CIVIL ENGINEER M.S. Thesis
Mike V. Roberts Sep. 1981 78 p refs
(AD-A111386; AFIT-LSSR-88-81) Avail: NTIS HC A05/MF A01 CSCL 13/2

This thesis presents the results of a survey of twelve interactive graphics systems manufacturers and develops a simple model for economic decision analysis. The survey information includes costs of the systems, training times, and software available. From the survey information and extensive literature review, an analysis is developed to determine the feasibility of developing guidelines for each design office to determine whether it could justify automatic drafting. The model is based on: (1) the salaries of design engineers authorized in the design section; (2) the salaries of site developers authorized in the site development section; (3) the amount of time spent on design work and drafting; and (4) the cost of the interactive graphics system used to produce the designs and drawings. GRA

N82-25404# Lockheed Missiles and Space Co., Palo Alto, Calif.
PANEL OPTIMIZATION WITH INTEGRATED SOFTWARE (POIS). VOLUME 1: PANDA: INTERACTIVE PROGRAM FOR PRELIMINARY MINIMUM WEIGHT DESIGN Final Report, Jun. 1976 - Oct. 1980
David Bushnell Wright-Patterson AFB, Ohio AFWAL Jul. 1981 262 p refs
(Contract F33615-76-C-3105; AF Proj. 2307)
(AD-A110963; AFWAL-TR-81-3073-Vol-1) Avail: NTIS HC A12/MF A01 CSCL 01/3

An analysis and an interactive computer program are described through which minimum weight designs of composite, stiffened, cylindrical panels can be obtained subject to general and local buckling constraints and stress and strain constraints. The panels are subjected to arbitrary combinations of in-plane axial, circumferential, and shear resultants. Nonlinear material effects are included if the material is isotropic or has stiffness in only one direction (as does a discrete or a smeared stiffener). Several types of general and local buckling modes are included as constraints in the optimization process, including general instability, panel instability with either stringers or rings smeared out, local skin buckling, local crippling of stiffener segments, and general, panel, and local skin buckling including the effects of stiffener rolling. Certain stiffener rolling modes in which the panel skin does not deform but the cross section of the stiffener does deform are also accounted for. The interactive PANDA system consists of three independently executed modules that share the same data base. In the first module an initial design concept with rough (not necessarily feasible or accurate) dimensions are provided by the user in a conversational mode. In the second module the user decides which of the design parameters of the concept are to be treated by PANDA as decision variables in the optimization phase. In the third module the optimization calculations are carried out. Many examples are provided in which optimum designs obtained by PANDA are compared to those in the literature. Author (GRA)

N82-25405# Mid-American Solar Energy Complex, Minneapolis, Minn.
EVALUATION REPORT FOR FY 1981 OF MASEC'S PASSIVE-SOLAR COMMERCIAL-HEATING PROJECT
Sep. 1981 5 p refs
(Contract DE-AC02-79CS-30150)

(DE82-001765; MASEC-R-81-040) Avail: NTIS HC A02/MF A01

Technical information regarding passive solar applications in commercial buildings was transferred through seminars presented in three cities. The seminars addressed active solar, passive solar, and conservation technologies for renovation and retrofitting of private college buildings. A workbook covering the technologies was provided to each participant. A slide show consisting of 80 slides and a 4-page script introduces passive solar concepts as they are applied to commercial buildings. The audience is trade and professional design people including builders, developers and architects. The seminar is described and evaluated. DOE

N82-25406# Mid-American Solar Energy Complex, Minneapolis, Minn.

EVALUATION FOR FY 1981 OF MASEC'S NEW RESIDENTIAL SINGLE-FAMILY DWELLINGS PASSIVE SOLAR HEATING PROJECT

Sep. 1981 16 p refs

(Contract DE-AC02-79CS-30150)

(DE82-003138; MASEC-R-81-026) Avail: NTIS HC A02/MF A01

Results of a program to accelerate the utilization of energy conservation with passive and hybrid solar heating in new, single-family residential construction are evaluated. Program products are listed, including 20 passive solar house designs, workshops, seminars and presentations four workbooks or manuals, media articles, data from site monitoring, and two audio/visual presentations. The deliverables and products for the program are tabulated. DOE

N82-25407# Mound Lab., Miamisburg, Ohio.

GLASS FURNANCE PROJECT: APRIL - SEPTEMBER 1981

K. Armstrong and L. M. Klinger 30 Nov. 1981 9 p refs

(Contract DE-AC04-76DP-00053)

(DE82-004302; MLM-2876) Avail: NTIS HC A02/MF A01

The use of a joule-heated glass furnace, fitted with a Mound-developed offgas system, to reduce the volume of contaminated waste typical of that from nuclear power plants. Preparations, including completion of the offgas scrubbing system and installation of utilities were made for the receipt of the glass melter at Mound. The melter was delivered on September 22, 1981, and assembly and consolidation of the entire system immediately began. Preliminary work was initiated on procedural development, and an interface was established with the Mound glass ceramics laboratory to pinpoint areas requiring study. DOE

N82-25408# Mid-American Solar Energy Complex, Minneapolis, Minn.

SUMMARY OF PASSIVE SOLAR SINGLE-FAMILY RETROFITS, OPEN HOUSES, AND SEMINARS

Sep. 1981 13 p refs

(Contract DE-AC02-79CS-30150)

(DE82-001207; MASEC-R-81-027; P-102-1) Avail: NTIS HC A02/MF A01

Contract requirements, program objectives, progress to date, and workshop/seminar plans for each of the four retrofit projects are described. DOE

N82-25409# Mid-American Solar Energy Complex, Minneapolis, Minn.

EVALUATION FOR FY 1981 OF MASEC'S RETROFIT RESIDENTIAL SINGLE-FAMILY DWELLINGS PASSIVE SOLAR HEATING PROJECT

Sep. 1981 6 p refs

(Contract DE-AC02-79CS-30150)

(DE82-001188; MASEC-R-81-031; P-102-5) Avail: NTIS HC A02/MF A01

The utilization of energy conserving techniques with passive and hybrid solar heating in the retrofit single family housing market is investigated. Processes were developed that result in a 50 percent reduction in space heating energy use for 25 percent of all existing single family housing. DOE

N82-25410# Mid-American Solar Energy Complex, Minneapolis, Minn.

PROTOTYPE DESIGNS FOR PASSIVE-SOLAR APARTMENTS AND TOWNHOUSES

D. Kraft Sep. 1981 7 p refs

(Contract DE-AC02-79CS-30150)

(DE81-030867; MASEC-R-81-032; P-103-1) Avail: NTIS HC A02/MF A01

Seven designs of passive solar apartments and townhouses are briefly described. Descriptions of the layouts, thermal insulation, thermal mass, source of passive solar gain, and thermal integrity factor for auxiliary heating are presented. DOE

N82-25411# Mid-American Solar Energy Complex, Minneapolis, Minn.

PROJECT SUNRISE: A COMMERCIAL BUILDING RETROFIT

Jul. 1981 28 p

(Contract DE-AC02-79CS-30150)

(DE82-000459; MASEC-TP-81-056; A-104-3) Avail: NTIS HC A03/MF A01

The preparation of a trade journal article on a solar system for a commercial building and the efforts made for its publication are described. The article itself is included in the appendix. DOE

N82-25412# Mid-American Solar Energy Complex, Minneapolis, Minn.

DESCRIPTION OF FIVE HOUSES INSTRUMENTED FOR CLASS B ANALYSIS

Aug. 1981 23 p

(Contract DE-AC02-79CS-30150)

(DE82-001186; MASEC-R-81-015; P-101-3) Avail: NTIS HC A02/MF A01

The five houses to be monitored are described along with the instrumentation. Floor plans are shown. The progress of the equipment procurement, installation, and the monitoring itself is summarized. DOE

N82-25413# Statens Provningsanstalt, Boraas (Sweden). Div. of Fire Technology.

FIRE: FULL SCALE TESTS. CALIBRATION OF TEST ROOM, PART 1

Bjoern Sundstroem and Ulf Wickstroem 1981 56 p refs

Prepared in cooperation with Lund Inst. of Technology, Sweden

(Contract Nordtest-143-78.2)

(SP-RAPP-1981:48) Avail: NTIS HC A04/MF A01

Calibration tests of a large scale fire room with inert walls are described. A gas burner giving constant heat input was placed at the rear wall, simulating an ignition source. Gas flows, temperature, radiation and CO2 and CO concentrations were thoroughly measured particularly in the doorway. Measurements and fire model data are compared. An upward gas flow is observed along the walls heated by radiation from the fire plume and the hot gas layer. This wall flow, not considered in existing two layer models, develops a layer between the neutral plane and the hot fire gases. The layer has moderate temperature and contains very little combustion product. This is verified by measuring CO2 concentration along the height of the doorway.

Author (ESA)

N82-25414# Nichols Engineering and Research Corp., Belle Mead, N.J.

THERMAL CONVERSION OF MUNICIPAL WASTEWATER SLUDGE. PHASE 2: STUDY OF HEAVY METAL EMISSIONS Final Report, Aug. 1978 - Jan. 1980

Sep. 1981 96 p

(Grant EPA-R-804463)

(PB82-111816; EPA-600/2-81-203) Avail: NTIS HC A05/MF A01 CSCL 13B

Heavy metal emissions associated with the thermal conversion (incineration) processes which can be conducted in a multiple hearth furnace to dry municipal wastewater (sewage) sludge and reduce its volume by forming an ash or char were analyzed. Sludge for this project was obtained from Jersey City, New Jersey. It contains about 8 percent solids which were increased to between 40 and 50 percent solid by adding polymer as a filter aid and filtering it in a 16 sp ft pilot filter press having expandable rubber diaphragm plates. A pilot scale multiple hearth furnace was used for the thermal conversion process. Sludge was subjected to thermal conversion of the conditions: incineration at 900 C (1625 F); low temperature conversion at 700 C

(1290 F) (starved combustion for pyrolysis; and high temperature conversion at 900 C (1290 F) (starved combustion or pyrolysis). GRA

N82-25415# Resource International, Inc., Worthington, Ohio.
FLEXIBLE PAVEMENT OVERLAY DESIGN PROCEDURES. VOLUME 1: EVALUATION AND MODIFICATION OF THE DESIGN METHODS Final Report, Sep. 1977 - Nov. 1980
Kamran Majidzadeh and George J. Ilves Aug. 1981 184 p refs 2 Vol.
(Contract DOT-FH-11-9315)
(PB82-136672; FHWA/RD-81/032) Avail: NTIS HC A09/MF A01 CSCL 13B

A ready reference to design procedures for asphaltic concrete overlay of flexible pavements based on elastic layer theory is provided. The design procedures and the analytical techniques presented were formulated to predict the structural fatigue response of asphaltic concrete overlays for various design conditions, including geometrical and material properties, loading conditions and environmental variables. GRA

N82-25416# Resource International, Inc., Worthington, Ohio.
FLEXIBLE PAVEMENT OVERLAY DESIGN PROCEDURES. VOLUME 2: USER MANUAL Final Report, Sept. 1977 - Nov. 1980
Kamran Majidzadeh and George J. Ilves Aug. 1981 127 p refs 2 Vol.
(Contract DOT-FH-11-9315)
(PB82-136680; FHWA/RD-81/033) Avail: NTIS HC A07/MF A01 CSCL 13B

This user manual outlines a procedure for the design of asphaltic concrete overlays on existing asphaltic concrete pavement surfaces. It is intended as a guide to the user on the type and form of information required as input to the procedure and contains all elements necessary for the user to prepare designs for flexible pavement overlays. GRA

N82-25417# Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
CONCRETE MECHANICS. PART A: THEORY AND EXPERIMENTS ON THE MECHANICAL BEHAVIOR OF CRACKS IN PLAIN AND REINFORCED CONCRETE SUBJECTED TO SHEAR LOADING
J. C. Walraven and H. W. Reinhardt 1981 72 p refs Repr. from Heron (Netherlands), v. 26, 1A, 1981 72 p 3 Vol.
(PB82-132705) Avail: NTIS HC A04/MF A01 CSCL 13C

The mechanism or transmission of forces across cracks whose faces are subjected to shear displacements are investigated. This mechanism is achieved by interaction of several components: axial and transverse stiffness (dowel action) of the reinforcement and direct transfer of force between the rough concrete crack faces, generally denoted by the term 'aggregate interlock'. Experimental research and the derivation of a theoretical model gave insight into the phenomenon. Tests were carried out on precracked shear specimens. Variables in the tests were the type of reinforcement (embedded reinforcing bars, external restraint bars), the concrete strength, the type of the concrete (sand gravel concrete, lightweight concrete), the grading of the concrete (continuous discontinuous), the scale of the concrete, and the initial crack width. Measurements were carried for determining the shear force, the crack displacements and, for the specimens with external reinforcement, the force in the restraining bars. GRA

N82-25418# Technische Hogeschool, Delft (Netherlands).
CONCRETE MECHANICS. PART B: NUMERICAL MODELLING OF BOND SLIP BEHAVIOR
A. K. deGroot, G. M. A. Kusters, and T. Monnier 1981 94 p refs Repr. from Heron (Netherlands), v. 26, no. 1B, 1981 94 p 3 Vol.
(PB82-132713) Avail: NTIS HC A05/MF A01 CSCL 13C

The development and verification of a numerical bond slip element suitable for plain as well as for deformed (ribbed) reinforcing bars is reported. First, the formula for the axially symmetric case are derived, then the results are generalized to the three dimensional case. Next, a procedure for effecting the transformation to the case of plane stress is proposed. After the theoretical treatment of the subject, the suitability of the bond slip element is assessed with reference to experimental results. More particularly, these relate to tests on cylindrical specimens, tests on rectangular prisms, and tests on specimens representing the end portions of beams. GRA

N82-25419# Technische Hogeschool Twente, Enschede (Netherlands).
CONCRETE MECHANICS. PART C: NUMERICAL MODELS FOR REINFORCED CONCRETE STRUCTURES IN PLANE STRESS
H. J. Grootenboer, S. F. C. H. Leitjen (SIPM - Holland), and J. Blaauwendraad (Rijkswaterstaat Bouwresearch) 1981 87 p refs Repr. from Heron (Netherlands), v. 26, no. 1C, 1981 87 p 3 Vol.
(PB82-132721) Avail: NTIS HC A05/MF A01 CSCL 13C

The Micro-model is a program based on a special type of finite element method for plates in plane stress. Material nonlinearities can be dealt with, but geometrical nonlinearity is not taken into account. Blood and bond slip are modelled. The possibility of having discrete cracks across elements in any direction is addressed. This makes the program particularly well suited to simulate structures which fail in a brittle mode in which one crack or just a few cracks dominate their behavior. The Macro-model is a program for plane beams and framed structures. Material nonlinearities as well as geometrical nonlinearities are dealt with. In this program the concept of 'smeared-our' cracks is applied. Only bond and bond slip between the main reinforcing bars and the concrete are modelled. T.M.

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

N82-25420*# Tennessee Univ., Knoxville. Dept. of Electrical Engineering.
A STUDY OF UNIVERSAL MODULATION TECHNIQUES APPLIED TO SATELLITE DATA COLLECTION Final Report
Dec. 1980 176 p refs
(Contract NAS5-24250)
(NASA-CR-166791; NAS 1.26:166791) Avail: NTIS HC A09/MF A01 CSCL 17B

A universal modulation and frequency control system for use with data collection platform (DCP) transmitters is examined. The final design discussed can, under software/firmwave control, generate all of the specific digital data modulation formats currently used in the NASA satellite data collection service and can simultaneously synthesize the proper RF carrier frequencies employed. A novel technique for DCP time and frequency control is presented. The emissions of NBS radio station WWV/WWVH are received, detected, and finally decoded in microcomputer software to generate a highly accurate time base for the platform; with the assistance of external hardware, the microcomputer also directs the recalibration of all DCP oscillators to achieve very high frequency accuracies and low drift rates versus temperature, supply voltage, and time. The final programmable DCP design also employs direct microcomputer control of data reduction, formatting, transmitter switching, and system power management. S.L.

N82-25421*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
FEASIBILITY OF SIMULTANEOUS OPERATION OF PASSIVE REMOTE MICROWAVE SENSORS AND ACTIVE SERVICES OCCUPYING ADJACENT FREQUENCY BANDS
M. K. Sue 1 May 1982 65 p refs
(Contract NAS7-100)
(NASA-CR-168985; JPL-Pub-82-27; NAS 1.26:168985) Avail: NTIS HC A04/MF A01 CSCL 20N

To ensure proper sensor operations, it is necessary to understand the situation of potential interference to sensors due to active equipment sharing common frequency bands as well as equipment occupying adjacent bands. The feasibility of sharing

common frequency bands between passive sensors and other active services was analyzed. Potential interference to sensors due to equipment in bands adjacent to sensor frequency bands is examined and criteria to avoid interference is developed. S.L.

N82-25422*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MODULATION/DEMODULATION TECHNIQUES FOR SATELLITE COMMUNICATIONS. PART 2: ADVANCED TECHNIQUES. THE LINEAR CHANNEL
Jim K. Omura and Marvin K. Simon 1 Mar. 1982 99 p refs 4 Vol.
(Contract NAS7-100)
(NASA-CR-168995; JPL-Pub-81-73-Pt-2; NAS 1.26:168995) Avail: NTIS HC A05/MF A01 CSCL 17B

A theory is presented for deducing and predicting the performance of transmitter/receivers for bandwidth efficient modulations suitable for use on the linear satellite channel. The underlying principle used is the development of receiver structures based on the maximum-likelihood decision rule. The application of the performance prediction tools, e.g., channel cutoff rate and bit error probability transfer function bounds to these modulation/demodulation techniques. A.R.H.

N82-25423*# Western Union Telegraph Co., McLean, Va. Government Systems Div.
WORLDWIDE SATELLITE MARKET DEMAND FORECAST Final Report
J. M. Bowyer, M. Frankfort, and K. M. Steinnagel 19 Jun. 1981 124 p refs
(Contract NAS3-22461)
(NASA-CR-167918; NASA-1-4-W-1-T11; NAS 1.26:167918) Avail: NTIS HC A06/MF A01 CSCL 17B

The forecast is for the years 1981 - 2000 with benchmark years at 1985, 1990 and 2000. Two types of markets are considered for this study: Hardware (worldwide total) - satellites, earth stations and control facilities (includes replacements and spares); and non-hardware (addressable by U.S. industry) - planning, launch, turnkey systems and operations. These markets were examined for the INTELSAT System (international systems and domestic and regional systems using leased transponders) and domestic and regional systems. Forecasts were determined for six worldwide regions encompassing 185 countries using actual costs for existing equipment and engineering estimates of costs for advanced systems. Most likely (conservative growth rate estimates) and optimistic (mid range growth rate estimates) scenarios were employed for arriving at the forecasts which are presented in constant 1980 U.S. dollars. The worldwide satellite market demand forecast predicts that the market between 181 and 2000 will range from $35 to $50 billion. Approximately one-half of the world market, $16 to $20 billion, will be generated in the United States. T.M.

N82-25424# Rome Air Development Center, Griffiss AFB, N.Y. Strategic Surveillance Branch.
RADAR FREQUENCY RADIATION Progress Report, Feb. 1978 - Sep. 1981
Edward Malowicki Nov. 1981 183 p ref
(AF Proj. 2059)
(AD-A111852; RADC-TR-81-347) Avail: NTIS HC A09/MF A01 CSCL 17/9

A method is presented for the determination of radar frequency radiation power densities that the PAVE PAWS radar system could produce in its air and ground environment. The effort was prompted by the concern of the people in the vicinity of OTIS AFB MA and BEALE AFB CA about the possible radar frequency radiation hazard of the PAVE PAWS radar. The method is based on the following main assumptions that: (a) the total field can be computed as the vector summation of the individual fields due to each antenna element; (b) the individual field can be calculated using distances for which the field point is in the far field of the antenna element. An RFR computer program was coded for the RADC HE 6180 digital computer and exercised to calculate the radiation levels in the air and ground space for the present baseline and the possible Six DB and 10 DB growth systems of the PAVE PAWS radar system at OTIS AFB MA. The average radiation levels due to the surveillance fence were computed for three regions: in the air space in front of the radar, at the radar hazard fence at OTIS AFB MA and at representative ground points in the OTIS AFB vicinity. It was concluded that the radar frequency radiation of PAVE PAWS does not present a hazard to personnel provided there is no entry to the air hazard zone or to the area within the hazard fence. The method developed offers a cost effective way to determine radiation levels from a phased array radar especially in the near field and transition regions. GRA

N82-25425# Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.
MEASUREMENTS OF NEAR SURFACE KINEMATICS UNDER WAVES AND WINDS Final Report, 1979 - 1981
Joseph N. Suhayda Oct. 1981 86 p refs
(Contract N00014-79-C-0618; NR Proj. 389-188)
(AD-A111884) Avail: NTIS HC A05/MF A01 CSCL 17/9

This report presents the results of the measurement of the drift of buoys during the MARSEN experiment, September and October 1979 and the numerical simulation of sea surface kinematics influenced by waves. The buoy observations were made by tracking the position of the buoys using a radio direction finder. The buoy drogues were deployed at various depths below the surface to study the velocity profile. The numerical model was used to predict wave properties at a sub-wavelength scale equal to that obtained with synthetic aperture radar so that deterministic SAR images could be made. Author (GRA)

N82-25426# Michigan Technological Univ., Houghton.
STATISTICAL PATTERN RECOGNITION TECHNIQUES AS APPLIED TO RADAR RETURNS Final Technical Report, Apr. - Sep. 1979
W. A. Fordon and A. A. Fraser Griffiss AFB, N.Y. RADC Dec. 1981 179 p refs
(Contract F30602-78-C-0102; AF Proj. 4506; Z512340)
(AD-A111893; RADC-TR-81-61) Avail: NTIS HC A09/MF A01 CSCL 17/9

This report presents a summary of the basic principles of pattern recognition and statistical decision theory and applies them to the problem of classifying radar returns. While pattern recognition techniques have been applied to radar signal detection problems, they have rarely been used in testing hypothesis for classifying radar returns. Two techniques, the parametric Bayes and the non-parametric K-Nearest Neighbor algorithms, were compared using simulated radar backscatter data. The error rate of these algorithms was the chief criterion used for the evaluation of performance. The results showed that the Nearest Neighbor technique gives a smaller error rate than the Bayes technique for the limited data sets tested.
Author (GRA)

N82-25427# Naval Research Lab., Washington, D. C.
POLYPHASE PULSE COMPRESSION WAVEFORMS Interim Report
F. F. Kretschmer and B. L. Lewis 5 Jan. 1982 24 p refs
(SF12141491)
(AD-A110751; NRL-8540) Avail: NTIS HC A02/MF A01 CSCL 17/9

This report discusses radar pulse-compression waveforms and the advantages of digital polyphase codes over analog waveforms. The Frank polyphase code is investigated in detail and generalized. It is shown that the relative sidelobes of a compressed Frank-coded waveform degrade in the presence of bandlimiting prior to pulse compression. The P1 and P2 polyphase codes are shown to be tolerant of precompression bandlimitation. Finally, applications for these polyphase codes are discussed.
Author (GRA)

N82-25428# Naval Research Lab., Washington, D. C. Technical Information Div.
NEW EYE FOR THE NAVY: THE ORIGIN OF RADAR AT THE NAVAL RESEARCH LABORATORY
David Kite Allison 29 Sep. 1981 223 p refs
(AD-A110586; NRL-8466) Avail: NTIS Avail: SOD HC $13.00 CSCL 17/9

This study narrates the origin of radar at the Naval Research Laboratory. Radar should be seen as the product not simply of one man or even a group of men but rather as the result of individuals working within the structure of a mission-oriented

research-and-development facility. To comprehend how radar was developed, when it was developed, and why, one must follow not just the evolution of technical progress but also the administrative and political decisions that shaped it. One must understand how the talents and motivations of the people who created this new device were related to the particular institutional situation and historical context in which they labored. The account is the story of a modern research-and-development laboratory in action. It discusses one major accomplishment of one institution. But it is also written to contribute to a broader understanding of the history of research and development laboratories in general and of the influence they have had on the course of modern American history. The work of the Naval Research Laboratory on radar is a significant episode in that story. GRA

N82-25429# Naval Research Lab., Washington, D. C. Electromagnetic Branch.

RAY CONSTRAINTS ON THE DESIGN OF AN OFFSET FEED ARRAY FOR A DUAL REFLECTOR SYSTEM USING A GUIDED COMPUTER SEARCH METHOD Interim Report

J. K. Hsiao 2 Mar. 1982 18 p refs
(XF2122555)
(AD-A111454; NRL-MR-4744) Avail: NTIS HC A02/MF A01 CSCL 09/1

In this report an offset feed double-reflector is described. The two foci of the ellipse area at the center of the main reflector and at the center of the feed array. A search algorithm based on ray constraints is used to design such a system which can achieve a minimum size for both the subreflector and the feed array. At the same time this design also minimizes the blockage problem and achieves the best array illumination function. Typical design results for different scan angles are presented. Author (GRA)

N82-25430# Teledyne Brown Engineering, Huntsville, Ala. Systems Div.

TIME-VARYING RCS MODELING ALGORITHMS

W. J. Gruner, ed. Dec. 1981 91 p refs
(Contract DASG60-79-C-0094)
(AD-A111234; MSB81-WIC-0033) Avail: NTIS HC A05/MF A01 CSCL 17/9

Teledyne Brown Engineering (TBE) has developed high-fidelity exoatmospheric time-varying radar cross section (RCS) models for use in the Warning Information Correlation (WIC) threat development effort. These models have been developed for the objects of six USSR ICBM and SIBM weapon systems. This report describes the five TBE developed time-varying RCS modeling algorithms that were utilized for these models. Part of the validation of these models consisted of comparisons of selected discrimination signatures calculated from model and recorded data. The definition of these signatures is also presented. GRA

N82-25431# Lincoln Lab., Mass. Inst. of Tech., Lexington. Group 61.

EHF PROPAGATION THROUGH FOLIAGE

Alan J. Simmons 23 Dec. 1981 31 p refs
(Contract F19628-80-C-0002)
(AD-A110888; TR-594; ESD-TR-81-323) Avail: NTIS HC A03/MF A01 CSCL 20/14

An EHF experiment was performed in which a 30-foot maple tree was placed between a 2-foot parabolic antenna and a distant transmitting site operating at 20 and 44 GHz. The objective was to measure attenuation through foliage. Results indicate that attenuation is nearly the same at the two frequencies. A value of 4 dB/meter can be used as a rough guide for deciduous trees in full leaf. Measurements on single maple leaves and pine needle clusters plus a study of the literature tended to reinforce the conclusions of the tree experiment, and to show that evergreen trees can be expected to have similar attenuation values. Author (GRA)

N82-25432# Ohio Univ., Athens. Dept. of Electrical Engineering.

A METHOD OF PREDICTING THE INTERFERENCE MARGIN FOR NONDIRECTIONAL BEACONS Final Report, Jun. 1980 - Dec. 1981

R. Luebbers and T. Mullins Washington FAA Dec. 1981 40 p refs
(Contract DTFA01-80-C-10072)
(AD-A110753; OUEE-FAA-1-3; FAA-RD-81-84) Avail: NTIS HC A03/MF A01 CSCL 17/7

The purpose of this report is to describe a new method for determining the electric field strength produced by a Non-Directional Beacon (NDB) as a function of the important parameters involved which include distance, frequency, ground conductivity, and effective isotropic radiated power (EIRP). This method enables the determination of the coverage area within which the signal level from the NDB exceeds some critical value, usually 70 microvolts per meter (peak power). Applied to another NDB which might cause interference to the first, correcting for frequency difference to account for receiver selectivity, one can determine at any point the interference margin, (i.e., the amount by which the desired NDB signal exceeds the undesired and potentially interfering signal). This interference margin must be at least 15 dB for satisfactory operation. The scope of this report includes frequencies from 190 to 535 kHz. Author (GRA)

N82-25433# Mission Research Corp., Albuquerque, N. Mex.

ELECTROMAGNETIC CHARACTERIZATION OF A MARX PULSE GENERATOR Final Report

D. V. Giri and F. R. Graham Kirtland AFB, N. Mex. AFWL Jul. 1981 129 p refs
(Contract F29601-78-C-0082; AF Proj. 3763)
(AD-A111506; AFWL-TR-81-31) Avail: NTIS HC A07/MF A01 CSCL 09/5

This report reviews the electrical characteristics of the Marx pulser installed in ATLAS I (TRESTLE) facility. Various individual components of the pulser, e.g., monocone switch, central Marx column and peaker arms are studied for their electromagnetic properties. The resulting design curves and tables for peaker arm optimization are presented along with calculated pulser output waveforms for step inputs. Also included is a list of recommendations for future work. Author (GRA)

N82-25434# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

THE DESIGN AND PERFORMANCE CHARACTERISTICS OF A CELLULAR LOGIC 3-D IMAGE CLASSIFICATION PROCESSOR Ph.D. Thesis

Lawrence A. Ankeney Apr. 1981 165 p refs
(AD-A111326; AFIT/DS/EE/81-1) Avail: NTIS HC A08/MF A01 CSCL 17/9

The introduction of high resolution scanning laser radar systems which are capable of collecting range and reflectivity images, is predicted to significantly influence the development of processors capable of performing autonomous target classification tasks. Actively sensed range images are shown to be superior to passively collected infrared images in both image stability and information content. An illustrated tutorial introduces cellular logic (neighborhood) transformations and two and three dimensional erosion and dilation operations which are used for noise filters and geometric shape measurement. A unique 'cookbook' approach to selecting a sequence of neighborhood transformations suitable for object measurement is developed and related to false alarm rate and algorithm effectiveness measures. The cookbook design approach is used to develop an algorithm to classify objects based upon their 3-D geometrical features. A Monte Carlo performance analysis is used to demonstrate the utility of the design approach by characterizing the ability of the algorithm to classify randomly positioned three dimensional objects in the presence of additive noise, scale variations, and other forms of image distortion. Author (GRA)

N82-25435# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.

A CASE STUDY OF RELIABILITY AND MAINTAINABILITY OF THE F-16 APG-66 FIRE CONTROL RADAR M.S. Thesis

Daniel DeMarchi Sep. 1981 115 p refs
(AD-A111387; AFIT-LSSR-99-81) Avail: NTIS HC A06/MF A01 CSCL 17/9

During the development and test phase of weapon system acquisition, program management and design emphasis must be directed to producing a system that achieves reliability and maintainability in the field. Investigated were these development

and test efforts and test efforts and the demonstrated operational performance of a major weapon subsystem in the form of a case study analysis of the F-16 fire control radar. Comparisons of predicted, test-demonstrated and operational APG-66 reliability and maintainability parameters constitute the significant portion of the analyses. In addition, the reliability and maintainability programs and selected performance indicators of the APG-66 and APQ-120 are compared in order to examine the results of differing test-program acquisition policies. This thesis effort determined that the APG-66 has not yet attained a constant failure rate indicative of an equipment's useful life. The research also determined that increased efforts in the test function of an acquisition produces significant benefits in operational results. A summary analysis of the entire program found the predictions based upon the critical design review and intermediate level maintainability demonstration to be somewhat optimistic. GRA

N82-25436# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PASSIVE RADIOLOCATION
Ye. A. Malyshkin 23 Feb. 1982 133 p Transl. into ENGLISH of Passivnaya Radiolokatsiya (USSR), 1961 p 1-69
(AD-A112160; FTD-ID(RS)T-1359-81) Avail: NTIS HC A07/MF A01 CSCL 17/4

The application of passive radar systems to military technology is outlined. Passive methods of target detection by ultrahigh radiowave propagation are examined. The following topics are discussed: (1) passive radar systems from reception of thermal radio emission signals; (2) high frequency amplifiers of passive radar systems; (3) reception methods of thermal radio emission signals; (4) passive aircraft detection by the emission of onboard radar transmitters; (5) passive detection of ICBM's; (6) passive detection of submerged submarines. E.A.K.

N82-25437# Laboratory for Electronic Development of the Armed Forces, Oegstgeest (Netherlands).
A DOPPLAR RADAR FOR VELOCITY MEASUREMENTS OF SMALL PROJECTILES
H. R. vanEs May 1981 66 p refs In DUTCH; ENGLISH summary
(Contract A79/KL/130)
(LEOK-TR-1981-01; TDCK-75271) Avail: NTIS HC A04/MF A01

A Doppler radar velocity measurement system for small projectiles was developed. The system uses a CW Doppler homodyne radar. It is capable of measuring projectiles with a diameter of 3 mm at a distance of 20 m. Comparison between simulations and test fixings prove that initial velocity as well as drag coefficient can be determined with an accuracy < or = 3%. It is concluded that the fluence of tunnel environment and shock waves on the measurement is not detectable and Sabot particles completely disturb the measurement. Author (ESA)

N82-25438# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
A COMPARATIVE STUDY OF ELECTROMAGNETIC COMPATIBILITY (EMC) ANALYTICAL PREDICTIONS AND MEASUREMENTS Final Report
I. D. Clough, comp. and W. E. Boud, comp. Paris ESA Mar. 1981 107 p refs
(Contract ESTEC-3691/78/NL-HP)
(BAe-TP-7855; ESA-CR(P)-1538) Avail: NTIS HC A06/MF A01

Predictions by the specification and EMC analysis program (SEMCAP) used in the design of communication satellites to analyze and control EMC of electronic subsystems and wiring are compared with OTS, MAROTS and Meteosat data. The SEMCAP values are also checked against measurements on an experimental model of cable-coupled interference. A simple system handbook is provided. For a configuration of generators, receptors and wires, SEMCAP agrees reasonably well with measurements. The bundle shielding effect (of wires in the bundle other than those constituting the hard wire connections studied) introduces discrepencies. If this effect is allowed for in modelling, agreement with measurements is good. Author (ESA)

N82-25439# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.
DESIGN AND LAYOUT OF RECTANGULAR WAVEGUIDE HORNS ANTENNAS [BERECHNUNG UND AUSLEGUNG VON RECHTECKRILLENHORNSTRAHLERN]
Dietmar Fasold and Helge Pecher 1981 8 p refs Repr. from Mikrowellen Magazin, v. 1, 1981 p 39-52 In GERMAN
(MBB-UR-578-81-O) Avail: NTIS HC A02/MF A01

Theoretical basis of waveguide horn antennas (WHA) is outlined. Applicable design curves, such as nomograms for determining gain and a diagram for laying out necessary waveguide dimensions, are given. Use of WHA designs in satellite radio and television systems is discussed. Antenna radiation pattern calculations are treated and optimization problems are dealt with. Based on design feasibility results, a laboratory model of a transmitter antenna for TV-SAT was built. The equipment, an elliptical waveguide horn design, demonstrates satisfactory performance. Author (ESA)

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N82-25440*# National Aeronautics and Space Administration. Pasadena Office, Calif.
GENERAL LOGIC STRUCTURE FOR CUSTOM LSI CIRCUITS Patent Application
Michael W. Sievers, inventor (to NASA) (JPL, California Inst. of Technology, Pasadena) Filed 12 Jun. 1981 28 p
(Contract NAS7-100)
(NASA-Case-NPO-14410-2; US-Patent-Appl-SN-272838) Avail: NTIS HC A03/MF A01 CSCL 09C

A general logic structure (GLS) for custom large scale integration (LSI) circuit substrates from which a plurality of negative ohmic resistance (NOR) gate logic circuits can be formed and interconnected to form more complex logic circuits is described. The GLS is formed so that a plurality of overlay masks defining cuts and contacts on the GLS transforms it into a specific custom logic circuit comprising a plurality of NOR gates. The overlay masks defining cuts and contacts can be computer generated, thereby providing a means whereby custom LSI cicuits can be rapidly manufactured, tested, and reconfigured at a minimum cost. J.D.

N82-25441*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPUTER MODELING OF MULTIPLE-CHANNEL INPUT SIGNALS AND INTERMODULATION LOSSES CAUSED BY NONLINEAR TRAVELING WAVE TUBE AMPLIFIERS
N. Stankiewicz May 1982 26 p
(NASA-TP-1999; E-722; NAS 1.60:1999) Avail: NTIS HC A03/MF A01 CSCL 09A

The multiple channel input signal to a soft limiter amplifier as a traveling wave tube is represented as a finite, linear sum of Gaussian functions in the frequency domain. Linear regression is used to fit the channel shapes to a least squares residual error. Distortions in output signal, namely intermodulation products, are produced by the nonlinear gain characteristic of the amplifier and constitute the principal noise analyzed in this study. The signal to noise ratios are calculated for various input powers from saturation to 10 dB below saturation for two specific distributions of channels. A criterion for the truncation of the series expansion of the nonlinear transfer characteristic is given. It is found that he signal to noise ratios are very sensitive to the coefficients used in this expansion. Improper or incorrect truncation of the series leads to ambiguous results in the signal to noise ratios. Author

N82-25442*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Electrical Engineering.
INPUT FILTER COMPENSATION FOR SWITCHING REGULATORS Final Report

Fred C. Lee and S. S. Kelkar 10 May 1982 56 p refs
(Grant NAG3-81)
(NASA-CR-169005; NAS 1.26:169005) Avail: NTIS HC A04/MF A01 CSCL 09C

The problems caused by the interaction between the input filter, output filter, and the control loop are discussed. The input filter design is made more complicated because of the need to avoid performance degradation and also stay within the weight and loss limitations. Conventional input filter design techniques are then dicussed. The concept of pole zero cancellation is reviewed; this concept is the basis for an approach to control the peaking of the output impedance of the input filter and thus mitigate some of the problems caused by the input filter. The proposed approach for control of the peaking of the output impedance of the input filter is to use a feedforward loop working in conjunction with feedback loops, thus forming a total state control scheme. The design of the feedforward loop for a buck regulator is described. A possible implementation of the feedforward loop design is suggested. J.D.

N82-25443*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MULTIMODE FIBER OPTIC WAVELENGTH DIVISION MULTIPLEXING
J. Larry Spencer Apr. 1982 19 p refs
(NASA-TM-84483; NAS 1.15:84483) Avail: NTIS HC A02/MF A01 CSCL 09C

Optical wavelength division multiplexing (WDM) systems, with signals transmitted on different wavelengths through a single optical fiber, can have increased bandwidth and fault isolation properties over single wavelength optical systems. Two WDM system designs that might be used with multimode fibers are considered and a general description of the components which could be used to implement the system are given. The components described are sources, multiplexers, demultiplexers, and detectors. Emphasis is given to the demultiplexer technique which is the major developmental component in the WDM system. Author

N82-25444# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
COMBINED PLUS INTEGRAL CONTROL IN THE SERVO SYSTEMS
B. V. Novoselov 20 Jan. 1982 26 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Elektromakhan. (USSR) no. 2, 1970 p 188-197
(AD-A110615; FTD-ID(RS)T-1508-81) Avail: NTIS HC A03/MF A01 CSCL 13/9

Improvement of the quality of combined control servo systems in the presence of compensatory signals on a derivative of the input effect is examined. The measurement and differentiation of the input effect and the definition of the ratio between the levels of the compensatory signals and the parametes of the servo system is discussed. Error compensation and the reduction of oscillation by using both combined and integral control is recommended. J.D.

N82-25445# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE USE OF SELF-TUNING LOOPS FOR GUARANTEEING THE QUASI-OPTIMAL CHARACTERISTICS OF SERVO SYSTEMS OF COMBINED CONTROL
B. V. Novoselov 26 Jan. 1982 18 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Elektromekh. (USSR), no. 10, Oct. 1969 p 1120-1125
(AD-A110982; FTD-ID(RS)T-1504-81) Avail: NTIS HC A02/MF A01 CSCL 09/5

The dependence of the accuracy, oscillation property, and freedom from interference of servo systems of combined control (SSKR) on the transfer function (KU) of the compensator is discussed. Selection of the stationary parameters of KU such that the quasi-optimal characteristics of SKKR are insured is proven to be virtually impossible. The advisability of using self-tuning loops for guaranteeing the quasi-optimal characteristics of SSKR is demonstrated. J.D.

N82-25446# Naval Research Lab., Washington, D. C. Microwave Technology Branch.
COMPUTER PROGRAM FOR MICROWAVE GaAs MESFET MODELING Interim Report
R. E. Neidert 12 Feb. 1982 49 p refs
(RR0210346)
(AD-A111299; NRL-8561) Avail: NTIS HC A03/MF A01 CSCL 09/3

A computer program is described which is used to calculate the equivalent circuit element values for microwave MESFETs (metal-semiconductor field effect transistors). The input information required by the program consists of the semiconductor material parameters and the physical dimensions of the semiconductor material and metallization. The program's name is FETREN; it is fully analytical and is inexpensive to use; it is written in FORTRAN language and configured for use with the Control Data Corporation timeshare system. A listing is provided. Author (GRA)

N82-25447# Stanford Univ., Calif. Inst. for Plasma Research.
STUDY OF NOISE IN CROSSED-FIELD ELECTRON GUNS Final Technical Report, 1 May 1977 - 31 Oct. 1981
F. W. Crawford Dec. 1981 15 p refs
(Grant AF-AFOSR-3306-77; AF Proj. 2305)
(AD-A110542; SU-IPR-861; AFOSR-82-0014TR) Avail: NTIS HC A02/MF A01 CSCL 09/1

A theoretical program was carried out for determining the source of excess noise in crossed-field diodes. The theory was based on the assumption that the noise was due to instabilities arising from the continuous interaction between the reflection of electrons back to the cathode and the effective beam potential in front of the cathode. The generation of noise by the interaction was studied for unbounded parallel-plate short circuited diodes. The theory was carried out first in the absence of transit time effects and then later with the inclusion of transit time effects. Although the numerical results for the theory in the absence of transit time effects showed noise factors always less than unity, it is believed that numerical calculations yet to be carried out for the case including transit time effects will show noise factors in excess of unity and therefore the required condition for excess noise generation. Author (GRA)

N82-25448# Stanford Univ., Calif. Dept. of Materials Science and Engineering.
FABRICATION AND PROPERTIES OF MULTILAYER STRUCTURES Semiannual Technical Report, 1 Mar. - 31 Aug. 1981
W. A. Tiller, T. W. Barbee, Jr., W. Dibble, L. Nagel, A. Savan, K. Seaward, and Y. T. Thathachari Nov. 1981 52 p refs
(Contract MDA903-79-C-0484; ARPA Order 3706)
(AD-A111001; SU-DMS-81-R-7; SATR-4) Avail: NTIS HC A04/MF A01 CSCL 18/8

An in-situ argon ion-gun cleaning technique was developed to strip the native SiO2 film from the Si substrates prior to the actual deposition of SiO(x) and SiC films. Etch rate data for the native oxide on SiO2 and the relative film thickness for reactively sputtered SiO2 films as a function of substrate temperature for etched substrates was gathered. The relative deposition rate and film texture for single-source sputtered SiC films as a function of substrate type, orientation and film texture was obtained. Exploratory films of SiO(x), WO(x) and NbC(0.88) were fabricated using the sequential deposition of atomic layers technique. In the theoretical area, the CNDO/2 technique was used to determine the energies of formation for bridging oxygen vacancies, and Frenkel defects for a pair of silica structural units (dimer and tetramer ring). In addition, calculations were made for the absorption of different molecular chemical speccies (in the parallel configuration) at the bridging oxygen site of a silica dimer. T.M.

N82-25449# Parke Mathematical Labs., Inc., Carlisle, Mass.
TOPICS IN OPTICAL MATERIALS AND DEVICE RESEARCH - 2, VOLUME 2 Final Report, 1 Apr. 1978 - 30 Sep. 1980
T. B. Barrett, H. Haskel, C. E. Ryan, R. V. Wood, and S. P. Yukon Griffiss AFB, N.Y. RADC Jan. 1982 88 p refs
(Contract F19628-78-C-0089; AF Proj. 4600)
(AD-A111481; RADC-TR-81-372-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 09/5

A new analysis of fiber-optic wavelength multiplexing was developed. A study of the limitations imposed by materials quality on CCD's was carried out. The SiO2-Si interface and its problems

were investigated. Epitaxial growth mechanism for silicon, silicon nitride and silicon dioxide were studied. A theory was developed to describe time-domain reflectometry return signals.
Author (GRA)

N82-25450# Texas Technological Univ., Lubbock. Plasma Lab.
WORKSHOP ON REPETITIVE OPENING SWITCHES Final Report
M. Kristiansen and K. H. Schoenbach 20 Apr. 1981 335 p refs Workshop held at Tamarron, Colorado, 28-30 Jan. 1981
(Contract DAAG29-76-D-0100)
(AD-A110770) Avail: NTIS HC A15/MF A01 CSCL 09/1

A workshop on Repetitive Opening Switches was conducted by Texas Tech University for the U.S. Army Research Office. Several papers on a wide range of innovative opening switch concepts were presented. Discussions about the research needs to advance the state-of-the-art in this important, emerging field are summarized. A concensus on research topics and their importance is summarized and a suggested research priority list given.
Author (GRA)

N82-25451# Washington Univ., St. Louis, Mo. Dept. of Electrical Engineering.
PERFORMANCE LIMITS ON ON GaAs FET LARGE- AND SMALL-SIGNAL CIRCUITS Final Report, 1 Mar. 1980 - 30 May 1981
D. R. Green, Jr. and F. J. Rosenbaum Oct. 1981 200 p refs
(Contract N00014-80-C-0318; XR0210201)
(AD-A110736; NRL-81-1) Avail: NTIS HC A09/MF A01 CSCL 20/12

A describing function approach to large-signal frequency-domain simulations of nonlinear microwave circuits is presented. It is used to examine gain saturation and harmonic distortion of a 0.5 micron gate FET. The simulation uses a previously reported FET model, modified to include gate breakdown and substrate leakage current. Temperature effects are studied. It is found that gain saturation does not depend on gate breakdown. The model is verified by comparing theoretical and experimental performance.
Author (GRA)

N82-25452# Sperry Univac, St. Paul, Minn. Defense Systems Div.
COMPUTER-AIDED DESIGN/MANUFACTURING (CAD/M) FOR HIGH-SPEED INTERCONNECT Final Report, 16 Jul. 1980 - 15 Aug. 1981
Norbert F. Santoski Wright-Patterson AFB, Ohio AFWAL Oct. 1981 94 p refs
(Contract F33615-80-C-1175; AF Proj. 6096)
(AD-A111395; AFWAL-TR-81-1189) Avail: NTIS HC A05/MF A01 CSCL 09/5

The objective of the Computer-Aided Design/Manufacturing (CAD/M) for High-Speed Interconnect Program study was to assess techniques for design, analysis and fabrication of interconnect structures between high-speed logic ICs that are clocked in the 200 MHz to 5 GHz range. Interconnect structure models were investigated and integrated with existing device models. Design rules for interconnects were developed in terms of parameters that can be installed in software that is used for the design, analysis and fabrication of circuits. To implement these design rules in future software development, algorithms and software development techniques were defined. Major emphasis was on Printed Wiring Board and hybrid level circuits as opposed to monolithic chips. Various packaging schemes were considered, including controlled impedance lines in the 50 to 200 ohms range where needed. The design rules developed are generic in nature, in that various architecture classes and device technologies were considered.
Author (GRA)

N82-25453# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
A RELIABLE BROADCAST ALGORITHM
Adrian Segall and Baruch Awerbuch Jan. 1982 22 p refs Submitted for publication Prepared in cooperation with Technion - Israel Inst. of Technology
(Contracts N00014-75-C-1183; N00014-77-C-0532; NR Proj. 049-383; ARPA Order 3045)
(AD-A110948; LIDS-P-1177) Avail: NTIS HC A02/MF A01 CSCL 12/1

Broadcast in a communication network is the delivery of copies of messages to all nodes. A broadcast algorithm is reliable if all messages reach all nodes in finite time, in the correct order and with no duplicates. The present paper presents an efficient reliable broadcast algorithm.
Author (GRA)

N82-25454# Massachusetts Inst. of Tech., Cambridge.
DIGITAL SIGNAL PROCESSING Final Report, 15 Jan. 1975 - 30 Jun. 1981
A. V. Oppenheim 1981 20 p refs
(Contract N00014-75-C-0951; ARPA Order 1997; NR Proj. 049-328)
(AD-A110902) Avail: NTIS HC A02/MF A01 CSCL 09/3

During the course of this contract, there have been several major task areas: the development of homomorphic signal processing techniques and their application to the development of a homomorphic vocoder and other signal processing applications; the development and implementation of techniques for enhancement and bandwidth compression of degraded speech; the development and evaluation of techniques for processing of multidimensional signals and the application of these techniques to image processing, and the processing of other multidimensional data sets; and the development of techniques and the implementation and evaluation of systems for speed transformations of speech.
GRA

N82-25455# Lincoln Lab., Mass. Inst. of Tech., Lexington. Data Systems Div.
ADVANCED ELECTRONIC TECHNOLOGY Quarterly Technical Summary Report, 1 May - 31 Jul. 1981
Alan J. McLaughlin and Alan L. McWhorter 15 Aug. 1981 25 p refs
(Contract F19628-80-C-0002; AF Proj. 649L)
(AD-A110509; ESD-TR-81-273) Avail: NTIS HC A02/MF A01 CSCL 20/12

Topics include: Digital Integrated Circuits -Advanced Circuit Design and Simulation, Restructurable VLSI (RVLSI) Technology, Semiconductor Processing, and Device Theory; Computer Systems; Solid State Device Research, Quantum Electronics, Materials Research, Microelectronics, and Analog Device Technology.
GRA

N82-25456# IIT Research Inst., Chicago, Ill.
PRINTED WIRING ASSEMBLY AND INTERCONNECTION RELIABILITY Final Technical Report, Feb. 1980 - Aug. 1981
David W. Coit Griffiss AFB, N.Y. RADC Nov. 1981 126 p refs
(Contract F30602-80-C-0078; AF Proj. 2338)
(AD-A111214; RADC-TR-81-318) Avail: NTIS HC A07/MF A01 CSCL 09/5

This report presents reliability prediction models for printed wiring assemblies, solderless wrap assemblies, wrapped and soldered assemblies, and discrete wiring assemblies w/electroless deposited PTH for inclusion in MIL-HDBK-217. Collected field failure rate data were utilized to develop and evaluate the factors. The reliability prediction models are presented in a form compatible with MIL-HDBK-217D.
Author (GRA)

N82-25457# Mission Research Corp., Albuquerque, N. Mex.
TRESTLE PULSER IMPROVEMENT STUDY Final Report
Kirtland AFB, N.Mex. AFWL Nov. 1981 154 p refs Prepared in cooperation with Pulsar Products, Inc., LuTech, Inc., Maxwell Labs., Inc., Physics International Co., and Pulse Sciences, Inc.
(Contract F29601-78-C-0082; AF Proj. 3763)
(AD-A111507; AFWL-TR-81-66) Avail: NTIS HC A08/MF A01 CSCL 09/5

This report documents theoretical efforts undertaken to determine the engineering feasibility of design modifications suggested for the purpose of improving the performance of the existing pulse generator system used in the TRESTLE facility. A test plan is outlined for the evaluation of these modifications, and approximate costs are given for the modifications.
Author (GRA)

N82-25458# Mitre Corp., Bedford, Mass.
CCD MULTI-FUNCTION PROCESSOR TEST BED

M. W. Paczan and S. M. Waldstein Hanscom AFB, Mass. ESD Jan. 1982 67 p refs
(Contract F19628-81-C-0001; AF Proj. 7170)
(AD-A111335; MTR-8417; ESD-TR-81-394) Avail: NTIS HC A04/MF A01 CSCL 09/5

This report describes the Charge-Coupled Device (CCD) Multi-Function Processor Test Bed developed to support the test and evaluation of, and experimentation with, second- and third-generation CCD Programmable Transversal Filters (PTF) developed for RADC/ESE by Texas Instruments. The test bed consists of the PTF Module and PTF Exerciser Module. These modules provide the circuitry necessary to program, operate, control, and interface the PTF device. The present level of performance justifies continued experimentation and investigations into applications of the PTF as a generic signal processing module. Two areas that will continue to be pursued in FY82 include comparing the performance of the PTF configured as an adaptive equalizer in a wideband HF system against an existing all-digital equalizer and, secondly, application of several PTF Modules as a matched filter in a spread-spectrum modem. GRA

N82-25459# Los Alamos Scientific Lab., N. Mex.
FIELD MANUAL: CALCULATION OF ELECTRIC FIELDS IN CONDUCTING MEDIA
J. D. Doss Oct. 1981 29 p
(Contract W-7405-eng-36)
(DE82-002959; LA-9012-M) Avail: NTIS HC A03/MF A01

A computer program (FIELD) written in BASIC that may be used to calculate electric potential, gradient, and power density distribution in conducting media is discussed. Either cylindrical or rectangular coordinate systems may be used. Information is supplied to assist users in providing necessary data for the program and in interpreting output. A program listing is appended. DOE

N82-25460# Research Inst. of National Defence, Linkoeping (Sweden).
MINOP: A COMPUTER PROGRAM FOR ANALYZING AND OPTIMIZING MICROWAVE CIRCUITS [MINOP. ETT DATOPROGRAM FOER ANALYS OCH OPTIMERING AV MIKOVAEGSKRETSAR]
Gunnar Filipsson Dec. 1981 55 p refs In SWEDISH
(FOA-C-30234-E) Avail: NTIS HC A04/MF A01

A program contains components and a subroutine library for dimensional analysis of components or complex systems and was developed as a basis for computer aided design. Program structure is described and interconnection and optimization routines are emphasized. The way to add to the library, according to user specific needs, is indicated. A dimensional analysis computation of a three gate circulator is shown. Author (ESA)

N82-25461# National Centre of Tribology, Risley (England). European Space Tribology Lab.
A REVIEW OF SLIDING ELECTRICAL CONTACTS FOR SPACE APPLICATION
E. W. Roberts Paris ESA Oct. 1981 42 p refs
(Contract ESA-4099/79/NL-PP)
(ESA-ESTL-52; ESA-CR(P)-1531) Avail: NTIS HC A03/MF A01

The status of slip ring technology is summarized. Adequate signal and power level performance is obtained from rings which comprise composite brushes, based on silver and incorporating molydbenum disulfide running against silver or rhodium plated rings. Composite brushes, containing niobium diselenide, perform well, but tend to produce higher electrical noise. This might improve if homogeneous niobium diselenide can be prepared. Gallium film lubrication of sliding contacts is extremely effective. However, the long term performance of this lubrication process is not known. Its implementation in a practical system appears to be impracticable. Wire brushes lead to high wear and noise when run against slip rings in the absence of lubrication. The addition of organic lubricants improves these characteristics. The lubricant is most effectively applied by condensation from the vapor of the chosen oil. This process requires, however, stringent precautions to prevent contamination by oil vapor of other spacecraft components. Author (ESA)

N82-25462# Statens Provningsanstalt, Boraas (Sweden). Centre for Metrology.
AUDIT MEASUREMENTS DURING 1980 WITHIN THE SWEDISH OFFICIAL STANDARDS LABORATORY ORGANIZATION: ELECTRICAL QUANTITIES
Haakan Nilsson and Bertil Andersson 26 Feb. 1981 27 p Partly in ENGLISH and SWEDISH
(SP-RAPP-1981:3) Avail: NTIS HC A03/MF A01

Active energy, capacitance, and resistance measurement accuracy of authorized measurement centers were checked. Center measurements on a static watthour meter, capacitors, and a resistor were compared with primary calibration center data. Of the 21 centers tested, one failed the watthour meter test, one failed the capacitors tests. Author (ESA)

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N82-25463*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COVERING SOLID, FILM COOLED SURFACES WITH A DUPLEX THERMAL BARRIER COATING Patent Application
C. H. Liebert, inventor (to NASA) Filed 8 Dec. 1981 9 p
(NASA-Case-LEW-13450-1; US-Patent-Appl-SN-328760) Avail: NTIS HC A02/MF A01 CSCL 20D

A thermal barrier coating is applied to solid film cooled hardware. Also, thermal barrier coating systems are used to provide corrosion resistance and thermal protection to these base metal surfaces. An inert gas, such as argon, is discharged through the apertures during the application of the thermal barrier coating system by plasma spraying. This flow of inert gas reduces both blocking of the holes and base metal oxidation during the coating operation. NASA

N82-25464# New South Wales Univ., Kensington (Australia). Dept. of Engineering.
INVESTIGATION OF THE USE OF METHOD OF INTEGRAL RELATIONS FOR SOLUTIONS OF STRONG SHOCK WAVE INTAKE DIFFUSERS M.S. Thesis
Le Ninh Nguyen 1980 183 p refs
Avail: NTIS HC A09/MF A01

The internal flow fields of the two dimensional convergent wedge type, pitot type, and spike type diffusers with a strong attached unswallowed curved shock wave at their inlet is analyzed. The direct method of integral relations was applied to the inviscid equations of the subsonic internal flow in the diffuser for the general case of arbitrary wedge or spike angle and of arbitrary free stream Mach number. First order theory results are presented for a range of wedge or spike angles and Mach numbers. First order theory and experiment were compared at a Mach number of 3 for the case of a two dimensional convergent wedge diffuser. S.L.

N82-25465# New South Wales Univ., Kensington (Australia). School of Chemistry.
PROPERTIES OF CURVED LIQUID/VAPOUR INTERFACES Ph.D. Thesis
Leonard Ross Fisher 1980 116 p refs
Avail: NTIS HC A06/MF A01

Curved liquid/fluid interfaces dominate the behavior of liquids in porous solids. Three equations associated with such interfaces are the Young-Laplace equation for liquid flow in cylindrical channels. The limits of applicability of these equations are studied together with some problems in their use. S.L.

N82-25466*# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Chemical Engineering.
PHYSICAL PHENOMENA IN CONTAINERLESS GLASS PROCESSING Annual Technical Report
R. Shankar Subramanian, Robert Cole, P. Annamalai, K. Jayaraj, P. Kondos, T. J. McNeil, and N. Shankar Jan. 1982 13 p

(Contract NAS8-32944)
(NASA-CR-162007; NAS 1.26:162007) Avail: NTIS HC A02/MF A01 CSCL 20D

Experiments were conducted on bubble migration in rotating liquid bodies contained in a sphere. Experiments were initiated on the migration of a drop in a slightly less dense continuous phase contained in a rotating sphere. A refined apparatus for the study of thermocapillar flow in a glass melt was built, and data were acquired on surface velocities in the melt. Similar data also were obtained from an ambient temperature fluid model. The data were analyzed and correlated with the aid of theory. Data were obtained on flow velocities in a pendant drop heated from above. The motion in this system was driven principally by thermocapillarity. An apparatus was designed for the study of volatilization from a glass melt. Author

N82-25467*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
TURBULENT BOUNDARY LAYER OVER SOLID AND POROUS SURFACES WITH SMALL ROUGHNESS Final Report
Fred Y. Kong, Joseph A. Schetz, and Fayette Collier Mar. 1982 88 p refs
(Grant NAG1-119)
(NASA-CR-168990; NAS 1.26:168990) Avail: NTIS HC A05/MF A01 CSCL 20D

Skin friction and profiles of mean velocity, axial and normal turbulence intensity, and Reynolds stress in the untripped boundary layer were measured directly on a large diameter, axisymmetric body with: (1) a smooth, solid surface; (2) a sandpaper-roughened, solid surface; (3) a sintered metal, porous surface; (4) a smooth, perforated titanium surface; (5) a rough solid surface made of fine, diffusion bonded screening, and (6) a rough, porous surface of the same screening. Results obtained for each of these surfaces are discussed. It is shown that a rough, porous wall simply does not influence the boundary layer in the same way as a rough solid wall. Therefore, turbulent transport models for boundary layers over porous surfaces either with or without injection or suction, must include both surface roughness and porosity effects. A.R.H.

N82-25468# Pennsylvania State Univ., University Park. Dept. of Mechanical Engineering.
THIRD SYMPOSIUM ON TURBULENT SHEAR FLOWS Final Report
F. W. Schmidt Sep. 1981 586 p refs Symp. held at Davis, Calif., 9-11 Sep. 1981
(Grant AF-AFOSR-0033-80; AF Proj. 2307)
(AD-A111522; AFOSR-82-0032TR) Avail: NTIS HC A25/MF A01 CSCL 20/4

The Third Symposium on Turbulent Shear Flow was held at the University of California, Davis, California on September 9-11, 1981. The objective of the symposium was to further advancement the understanding of the physical phenomena associated with turbulent flows and the existing capabilities for calculating items such as the transport of heat and mass in such processes. Of the 158 abstracts received by the papers committee, a total of 92 papers were included in the final program. In addition to the 17 papers sessions, an open forum and a debate were also scheduled. Twelve short 10-minute presentations were given in the open forum. A total of 242 registrants attended the meeting. Author (GRA)

N82-25469# Pittsburg Univ., Pa. Inst. for Computational Mathematics and Applications.
VORTEX DYNAMICS Final Report, 1 Aug. 1980 - 31 Oct. 1981
N. J. Zabusky 10 Feb. 1982 7 p refs
(Contract DAAG29-80-K-0072)
(AD-A111633; ARO-17337.2-M) Avail: NTIS HC A02/MF A01 CSCL 09/2

Summarizes the work done studying the stability and scattering of translating V-state solutions of the Euler equations in two-dimensions. This is a computer simulation study using the method of contour dynamics, a new boundary-integral evolutionary method. GRA

N82-25470# San Diego State Univ., Calif. Dept. of Aerospace Engineering and Engineering Mechanics.
COMPLIANT-COATING-FLUID INTERACTION: COATING LONGITUDINAL WAVES IN STATIONARY FLUID Final Report, Mar. 1981 - Feb. 1982
Mauro Pierucci and Paul A. Baxley Feb. 1982 32 p refs
(Contract N00014-81-K-0424; NR Proj. 062-693)
(AD-A111274; AE/EM/TR-82-04) Avail: NTIS HC A03/MF A01 CSCL 11/3

The presence of a thin non-homogeneous layer at the interface of an elastic and a fluid medium can alter the energy exchange between the two media. In this report the effect of the transition layer upon the propagation of one-dimensional longitudinal waves is analyzed. The motion of the lower boundary of the elastic layer is assumed known and the energy radiation into the fluid is obtained. GRA

N82-25471# San Diego State Univ., Calif. Dept. of Aerospace Engineering and Engineering Mechanics.
UNSTEADY SYMMETRY-PLANE BOUNDARY LAYER AND 3-D UNSTEADY SEPARATION. PART 1: HIGH INCIDENCE
K. C. Wang and Z. Q. Fan Jan. 1982 37 p refs
(Contract N00014-80-C-0307; NR Proj. 061-252)
(AD-A111438; AE/EM/TR-82-01-Pt-1) Avail: NTIS HC A03/MF A01 CSCL 20/4

The symmetry-plane laminar boundary layer of an impulsively-started ellipsoid of revolution at high incidence is solved to shed light on some basic characteristics of three dimensional, unsteady flows. The governing equations are formally similar to those for the 3-dimensional, steady case, so the same method of solution and computer programs previously developed were employed in the present work. The most important result obtained is concerned with the meridional skin friction c(fu). The zero-c(fu) point (at which c(fu) vanishes) does not, as expected, move forward as time increases, instead it remains over the rear body. As t approaches infinity, it jumps to the front nose. This implies that there is no flow separation over the symmetry-plane at finite times. In the meanwhile, it is argued that separation must occur on two sides of the body. This situation leads us to propose a new unsteady separation sequence, i.e. an open type separation prevails at earlier times, while a closed type of separation occurs only at the steady-state condition. This sequence presents a sharp contrast to the conventional notion of unsteady separation which consists of a series of closed separations only. Furthermore, this sequence with the time as the parameter is found to be similar to that for previously-studied steady flows with varying incidences. Author (GRA)

N82-25472# Wisconsin Univ. - Madison. Mathematics Research Center.
FORCED CONVECTION IN THREE-DIMENSIONAL FLOWS. PART 3: ASYMPTOTIC SOLUTIONS WITH VISCOUS HEATING
Matthew A. McClelland and Warren E. Stewart Nov. 1981 44 p refs
(Contract DAAG29-80-C-0041)
(AD-A110452; MRC-TSR-2295) Avail: NTIS HC A03/MF A01 CSCL 12/1

Asymptotic solutions are given for temperature profiles in laminar three-dimensional flows with viscous dissipation. The results are asymptotically valid for small thermal diffusivity; they hold for Newtonian or non-Newtonian fluids. The fluid properties are evaluated at an average temperature for the system; this is satisfactory for moderate temperature differences. Heat transfer formulas for various thermal boundary conditions are included. The general formulas are applied to several geometries; numerical results are obtained for a wire-coating operation. Author (GRA)

N82-25473# Wisconsin Univ. - Madison. Mathematics Research Center.
NEW DESCRIPTIONS OF DISPERSION IN FLOW THROUGH TUBES. CONVOLUTION AND COLLOCATION METHODS
James C. Wang and Warren E. Stewart Nov. 1981 22 p refs
(Contract DAAG29-89-C-0041; Grants NSF ENG-76-24368; NSF CPE-79-13162)

(AD-A110454; MRC-TSR-2297) Avail: NTIS
HC A02/MF A01 CSCL 20/4

The convective dispersion of a solute in steady flow through a tube is analyzed, and the concentration profile for any Peclet number is obtained as a convolution of the profile for infinite Paclet number. Close approximations are obtained for the concentration profile and its axial moments, by use of orthogonal collocation in the radial direction. The moments thus obtained converge rapidly, and the concentration profile less rapidly, toward exactness as the number of collocation points is increased. A two-point radial grid gives results of practical accuracy; analytical solutions are obtained at this level of approximation. Convective dispersion plays an important role in many processes of chemical reaction and separation. Such systems are commonly analyzed by use of a radially-averaged diffusion equation. The foregoing approach is not easy to apply to reaction or separation processes if the fluid properties vary, nor if the kinetics or equilibria are non-linear. Therefore, in this paper we consider an alternate method: we solve the full diffusion equation by orthogonal collocation in the radial direction. Non-reactive systems are emphasized here; reactive ones will be studied more fully in the sequel to this paper. GRA

N82-25474# Wisconsin Univ. - Madison. Mathematics Research Center.

HOMOGENEOUS AND NON-HOMOGENEOUS BOUNDARY VALUE PROBLEMS FOR FIRST ORDER LINEAR HYPERBOLIC SYSTEMS ARISING IN FLUID-MECHANICS. PART 1

H. Beirao daVeiga (Trento Univ., Italy) Nov. 1981 25 p refs
(Contract DAAG29-80-C-0041)
(AD-A110457; MRC-TSR-2300) Avail: NTIS
HC A02/MF A01 CSCL 20/4

This report seeks to prove the existence and the uniqueness of classical and strong solutions for a class of non-homogeneous boundary value problems for first order linear hyperbolic systems arising from the dynamics of compressible non-viscous fluids. The method provides the existence of classical solutions without resorting to strong or weak solutions. A necessary and sufficient condition for the existence of solutions for the non-homogeneous problem is proved. It consists of an explicit relationship between the boundary values of u and those of the data f. Strong solutions are obtained without this supplementary assumption. GRA

N82-25475# Wisconsin Univ. - Madison. Mathematics Research Center.

ADMISSIBILITY CRITERIA FOR PROPAGATING PHASE BOUNDARIES IN A VAN DER WAALS FLUID

M. Slemrod Sep. 1981 31 p refs
(Contract DAAG29-80-C-0041; Grants AF-AFOSR-0172-81; NSF MCS-79-02773)
(AD-A110467; MRC-TSR-2280) Avail: NTIS
HC A03/MF A01 CSCL 20/4

This paper gives admissibility criteria for weak solutions to the partial differential equations governing isothermal motion of a van der Waals fluid. The main issue is that an admissibility criterion based on viscosity alone is too restrictive - it rules out all slowly propagating phase boundaries. Instead a criterion based on viscosity and capillarity is proposed. The viscosity-capillarity condition is studied and shown to imply that the state on one side of a phase boundary specifies both the speed of the phase boundary and the state of the other side of the phase boundary (a result which is different from classical gas dynamics). GRA

N82-25476# Naval Academy, Annapolis, Md. Div. of Engineering and Weapons.

DYNAMIC RESPONSE OF HOVERCRAFT LIFT FANS

David D. Moran Aug. 1981 19 p refs Presented at the 3rd Intern. Homecraft Conf., Southampton, Engl., Nov. 1981
(AD-A110883; USNA-EW-12-81) Avail: NTIS
HC A02/MF A01 CSCL 20/4

Hovercraft lift fans are subjected to varying back pressure due to wave action and craft motions when these vehicles are operating in a seaway. The oscillatory back pressure causes the fans to perform dynamically, exhibiting a hysteresis type of response and a corresponding degradation in mean performance. Since Hovercraft motions are influenced by variations in lift fan pressure and discharge, it is important to understand completely the nature of the dynamic performance of lift fans in order to completely solve the Hovercraft seakeeping problem. The present study was performed to determine and classify the instabilities encountered in a centrifugal fan operating against time-varying back pressure. A model-scale experiment was developed in which the fan discharge was directed into a flow-measuring device, terminating in a rotating valve which produced an oscillatory back pressure superimposed upon a mean aerodynamic resistance. Pressure and local velocity were measured as functions of time at several locations in the fan volute. The measurements permitted the identification of rotating (or propagating) stall in the impeller. One cell and two cell configurations were classified and the transient condition connecting these two configurations was observed. The mechanisms which lead to rotating stall in a centrifugal compressor are presented and discussed with specific reference to Hovercraft applications. Author (GRA)

N82-25477# Naval Research Lab., Washington, D. C.

STEADY HYDRODYNAMIC LOADS DUE TO VORTEX SHEDDING FROM THE OTEC COLD WATER PIPE Final Report

Owen M. Griffin 13 Jan. 1982 57 p refs
(Grant NOAA-NA80-AA-G-03362)
(AD-A110459; NRL-MR-4698) Avail: NTIS
HC A04/MF A01 CSCL 20/4

This report is limited in scope to consideration of the problems caused by vortex shedding from flexible, bluff cylinders in steady current flows, as these problems apply to the OTEC cold water pipe. In particular, the steady deflections caused by the amplified drag forces that accompany vortex-excited oscillations are considered. Emphasis placed upon the discussion of design methods, applications of these methods to practical problems, and comparison with available experimental data. A discussion is given of laboratory and field studies that have been conducted with model OTEC cold water pipes. Various devices that have been developed for the suppression of vortex-excited oscillations also are discussed. A comparison is made of the effectiveness of various suppression devices and procedures, and practical approaches to implementing their application are presented. The implications of vortex-induced hydrodynamic drag and the suppression of vortex-excited oscillations in OTEC cold water pipe design are discussed briefly. GRA

N82-25478# Naval Research Lab., Washington, D. C.

SURFACE EFFECTS DUE TO SUBSURFACE PROCESSES: A SURVEY Interim Report

D. T. Chen 15 Jan. 1982 45 p refs
(RR0320841; RR0320402)
(AD-A110440; NRL-MR-4727) Avail: NTIS
HC A03/MF A01 CSCL 20/4

This report surveys the oceanic subsurface dynamic processes which have signatures on the ocean surface. These surface effects can appear in the form of changes in both surface current distributions and local wave structures (or profiles). Based upon their physical scales, these effects are classified into phenomena produced by mechanisms associated with weak and strong interactions. Two types of phenomena are distinct among surface wave weak interactions: (1) broad band phenomena--includes wave-wave energy transfer and general wave train instability; and (2) narrow band phenomena--includes Benjamin-Feir instability, recurrence, and envelope solutions. All these phenomena share the following physical characteristics: (1) they may be manifested only by the long dominant waves in a wave field and yet the behavior of short waves is determined by the strong interactions with the long waves rather than by these processes; and (2) they are evolutionary phenomena with a time scale of 1/(ak) sq times the wave period where a is the wave amplitude and k is the wave number of the dominant wave. The strong interactions are those phenomena whose time scale is of the order of the wave period and space scale is of the order of the wavelength. Detailed wave structures (or profiles) are the prime sources of information. Strong interactions include the strong Longuet-Higgins instability, wave-current interactions, long wave-short wave interactions, and the processes of parasitic capillary formation and microscale breaking induced by surface and drift. GRA

N82-25479# California Univ., Berkeley. Dept. of Mechanical Engineering.
MEASUREMENT AND CALCULATION OF DEVELOPING TURBULENT FLOW IN A U BEND AND DOWNSTREAM TANGENT OF SQUARE CROSS SECTION Annual Technical Report, 1 Oct. 1980 - 30 Sep. 1981
Joseph A. C. Humphrey, Sheng M. Chang, and Brian E. Launder (Manchester Univ.) Dec. 1981 43 p refs
(Contract N00014-80-C-0031; NR Proj. 097-440)
(AD-A110501; ATR-2) Avail: NTIS HC A03/MF A01 CSCL 20/5

A review is provided of the second year of research pertaining to the experimental measurement and numerical prediction of curved duct flows. Experimental measurements obtained using a laser-Doppler velocimeter, recent turbulence model developments and numerical calculations are presented and discussed. The current state of the research program is revised together with a work plan for year three of research. Author (GRA)

N82-25480# Notre Dame Univ., Ind. Dept. of Aerospace and Mechanical Engineering.
BOUNDARY LAYER AND SIDE FORCE CHARACTERISTICS OF NON-SPINNING AXISYMMETRIC BODIES Final Report, Jun. 1978 - Sep. 1981
Thomas J. Mueller, Robert C. Nelson, Jerome T. Kegelman, and Robert J. Zehentner Nov. 1981 100 p refs
(Contract DAAG29-80-C-0127; Grant DAAG29-78-G-0102)
(AD-A110664; UNDAS-TN-127; ARO-15336.5-E) Avail: NTIS HC A05/MF A01 CSCL 20/4

The results of an experimental investigation of the influence of spin and nose bluntness on the boundary layer characteristics and side force of a secant ogive nose axisymmetric body are presented. Smoke visualization data for the sharp and 10%, 20% and 30% spherically blunted noses were correlated with side forces measured at Reynolds numbers of 315,000 and 1,030,000, and spin rates up to 6000 rpm for angles of attack from 0 deg to 10 deg. Boundary layer flow asymmetries were correlated with the side forces measured to provide some insight into the origin of the side forces. Author (GRA)

N82-25481# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
COMPUTER ASSISTED VELOCITY AND TURBULENCE MEASUREMENTS IN A PLANE FREE JET A HIGH SUB-SONIC VELOCITIES M.S. Thesis
Michael J. Kirchner Dec. 1981 101 p refs
(AD-A111169; AFIT/GAE/AA/81D-17) Avail: NTIS HC A06/MF A01 CSCL 20/4

Methods and results of an experimental study of turbulence parameters for a plane free jet at high subsonic velocities, using hot wire anemometer signals outputing directly to an on-line computer controlled data acquisition system are reported. The apparatus studied had a nozzle exit, 1 x 10 cm, designed for two-dimensional flow. Two measurement planes at 25 and 50 jet widths downstream were chosen to provide measurements to compare with existing data for the facility. Nozzle velocities of $M = 0.4$ and $M = 0.6$ were chosen for the same reason. The techniques for employing hot-wire anemometry coupled with computer controlled data acquisition are described. A comparison of data obtained with the computer is made to data previously obtained by more traditional methods. A comparison of linearized and non-linearized anemometer output is made. A new calibration technique, also utilizing the data acquisition system to greatly decrease the sensor calibration time, was also developed. The turbulence parameters compared are mean velocity, turbulence intensities, micro-scale, and integral scale of turbulence. The computer determined parameters compared favorably in all cases with the already available data. Author (GRA)

N82-25482# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DESIGN, FABRICATION AND TESTING OF AN AXISYMMETRIC, ANNULAR, SUBSONIC DIFFUSER AND ASSOCIATED INSTRUMENTATION SYSTEMS M.S. Thesis
John V. Kelley, Jr. Dec. 1981 94 p refs
(AF Proj. 3066)
(AD-A111162; AFIT/GAE/AA/81D-16) Avail: NTIS HC A05/MF A01 CSCL 20/4

Aerodynamic parametric data of annular diffuser flow field for gas turbine engines are not available in sufficient detail. They are badly needed for future high efficiency engine design. A subsonic, axisymmetric, annular diffuser model was designed for the purpose of making such highly detailed information available. The objective of the design was to approximate an actual gas turbine engine diffuser. The diffuser was built according to these design specifications. The instrumentation required to gather the necessary pressure, velocity, and turbulence parameters consisted of three pitot tube systems, a hot wire anemometer system and a laser doppler velocimeter (LDV) system using frequency counting. These three instrumentation systems were integrated into the diffuser to obtain data at each of three points along the longitudinal axis. At each point there were five stations along the annulus that were instrumented. A longitudinal traversing structure utilizing motorized traversers for radial positioning and the capability to integrate absolute encoders was used to access the flow area. GRA

N82-25483# Statens Provningsanstalt, Boraas (Sweden). Div. of Fire Technology.
RATE OF HEAT RELEASE MEASUREMENTS WITH THE SWEDISH BOX TEST (NORDTEST NT FIRE 004)
Goeran S. Holmstedt 1981 49 p refs Prepared in cooperation with Lund Inst. of Technology, Sweden
(Contract Nordtest-143-78,2)
(SP-RAPP-1981:30) Avail: NTIS HC A03/MF A01

A method in which tendency to fire spread and smoke development is determined by gas temperature and smoke intensity measurements in relation to time was examined. The conventional measurement of exhaust gas temperature was tested against a measurement of the rate of heat release, using oxygen consumption calorimetry. Fourteen wall surfaces, including noncombustible materials of different thermal properties, wall linings and wood were used. Slow burning material shows good correlation between temperature measurement and rate of heat release. Fast burning material, however, consumes all the available oxygen and the temperature measurement becomes a measure of the thermal properties of the material. Author (ESA)

N82-26177# Government Engineering Coll., Jabalpur (India). Dept. of Mechanical Engineering.
A STUDY OF STREAMWISE VELOCITY PROFILES IN THREE DIMENSIONAL TURBULENT BOUNDARY LAYERS
Neeraj Dubey *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 117-119 refs (For primary document see N82-26161 16-99)
Avail: NTIS HC A08/MF A01

N82-26178# Indian Inst. of Tech., Madras. Dept. of Aeronautical Engineering.
NONSTEADY AXISYMMETRIC STAGNATION POINT FLOW WITH HARD BLOWING
A. Jagadesh Prasad and N. R. Rajappa *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 121-124 refs (For primary document see N82-26161 16-99)
Avail: NTIS HC A08/MF A01

N82-26187# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
DENSITY MEASUREMENTS IN AERODYNAMIC FLOWS USING FLUORESCENCE
R. Bailly, M. Pealat, and J. P. Taran *In its* La Rech. Aerospatiale, Bi-Monthly Bull. No. 1981-6, Nov.-Dec. 1981 (ESA-TT-741) Mar. 1982 p 17-25 refs Transl. by ONERA into ENGLISH from 'La Rech. Aerospatiale, Bull. Bimestriel (Paris) No. 1981-6, Nov.-Dec. 1981' (For primary document see N82-26185 16-99)
Avail: NTIS HC A04/MF A01; Original Report in FRENCH available at ONERA, Paris FF 55

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N82-25484*# National Aeronautics and Space Administration. Pasadena Office, Calif.

INSTRUMENTATION FOR SENSING MOISTURE CONTENT OF MATERIAL USING A TRANSIENT THERMAL PULSE Patent Application

Lien C. Yang, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 30 Nov. 1981 17 p
(Contract NAS7-100)
(NASA-Case-NPO-15494-1; US-Patent-Appl-SN-325885) Avail: NTIS HC A02/MF A01 CSCL 14B

Instrumentation is developed for sensing moisture content of material using a transient thermal pulse and is comprised of a sensing probe having a sensing element in the form of a ribbon excited by a constant current pulse to increase the temperature, and therefore the resistance, of the ribbon linearly. Moisture in web material limits the increase of temperature during the pulse in proportion to the moisture content. This increase in temperature produces a proportional increase in resistivity which is measured with a Wheatsone bridge as a change in voltage displayed by a measurement display unit. The probe is glued in a shallow groove of a lucite bar and connected to copper pins embedded in the bar. S.L.

N82-25485*# Hughes Aircraft Co., El Segundo, Calif. Space and Communications Group.

MULTIFREQUENCY APERTURE-SYNTHESIZING MICROWAVE RADIOMETER SYSTEM (MFASMR). VOLUME 1

C. A. Wiley and M. U. Chang 1 Jul. 1981 205 p refs 2 Vol.
(Contract NAS5-25755)
(NASA-CR-166792; NAS 1.26:166792; SCG-810344-Vol-1) Avail: NTIS HC A10/MF A01 CSCL 14B

Background material and a systems analysis of a multifrequency aperture - synthesizing microwave radiometer system is presented. It was found that the system does not exhibit high performance because much of the available thermal power is not used in the construction of the image and because the image that can be formed has a resolution of only ten lines. An analysis of image reconstruction is given. The system is compared with conventional aperture synthesis systems. R.J.F.

N82-25486*# Hughes Aircraft Co., El Segundo, Calif. Space and Communications Group.

MULTIFREQUENCY APERTURE-SYNTHESIZING MICROWAVE RADIOMETER SYSTEM (MFASMR). VOLUME 2: APPENDIX

C. A. Wiley and M. U. Chang 1 Jul. 1981 168 p refs 2 Vol.
(Contract NAS5-25755)
(NASA-CR-166793; NAS 1.26:166793; SCG-810345-Vol-2) Avail: NTIS HC A08/MF A01 CSCL 14B

A number of topics supporting the systems analysis of a multifrequency aperture-synthesizing microwave radiometer system are discussed. Fellgett's (multiple) advantage, interferometer mapping behavior, mapping geometry, image processing programs, and sampling errors are among the topics discussed. A FORTRAN program code is given. R.J.F.

N82-25487# Naval Research Lab., Washington, D. C. Underwater Sound Reference Detachment.

NEW F50 SENSOR DESIGN AND CABLE SEAL FABRICATION PROCEDURES Interim Report

M. D. Jevnager and A. C. Tims 9 Feb. 1982 10 p refs
(AD-A110894; NRL-MR-4586) Avail: NTIS HC A02/MF A01 CSCL 09/1

The USRD type F50 transducer has been a popular and useful transducer. Following the recommended sensor design improvements and cable seal fabrication procedures should remove several failure modes and make it a more reliable transducer. Author (GRA)

N82-25488# Perkin-Elmer Corp., Pomona, Calif. Aerospace Div.

TECHNIQUES SUITABLE FOR A PORTABLE WEAR METAL ANALYZER Final Report, Oct. 1980 - Apr. 1981

William H. Niu, Eric B. Andersen, and Gordon J. Fergusson Wright-Patterson AFB, Ohio AFWAL Sep. 1981 89 p refs
(Contract F33615-80-C-2037; AF Proj. 3048)
(AD-A111352; AFWAL-TR-81-2076) Avail: NTIS HC A05/MF A01 CSCL 20/8

A literature study for the techniques suitable for a portable wear metal analyzer has been conducted. The intent was to locate a technique which could lead to the development of a deployable field instrument to analyze metals in used aircraft engine oil for preventive maintenance purposes. Ten techniques, including six optical spectroscopic methods, two X-ray techniques, radioactive tagging, and colorimetry, were evaluated. Emphasis was placed on the fundamental limitations of each technique for this particular application. As a result, three optical techniques looked promising and their practicality was further investigated. The final assessment of these three techniques was based on the feasibility of making the instrument portable, low cost, able to analyze elements of interest, particle size independent, and with moderate power consumption. The three techniques, in order of suitability are: furnace atomic absorption spectroscopy, rotating disc electrode atomic emission spectroscopy, and dc plasma atomic emission spectroscopy. Author (GRA)

N82-25489# Harry Diamond Labs., Adelphi, Md.

IMPROVED DESIGN AURORA MODIFICATION PROGRAM (IDAMP)

Stewart E. Graybill, George A. Huttlin, Klaus G. Kerris, Alexander G. Stewart, and Denis A. Whittaker Dec. 1981 30 p refs
(Contract MIPR-81-559)
(AD-A111514; HDL-SR-81-8) Avail: NTIS HC A03/MF A01 CSCL 14/2

The AURORA High-Intensity Flash X-ray Facility could be modified to provide a high-energy, medium (2 to 10 omega) impedance, multiterawatt pulse power source. This Improved Design AURORA Modification Program (IDAMP) could be achieved with only modest restructuring of the existing AMP water-insulated pulser. Transformer oil, rather than deionized water, would be the insulating medium. A power output of >5 TW in a pulse of <5 MV amplitude and approx. = 140 ns FWHM is feasible in either positive or negative polarity. This power source could be applied to high-intensity electron, ion, and microwave beams. Author

N82-25490# California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.

DESIGN AND FABRICATION REPORT Final Report, 1 Mar. 1977 - 30 Sep. 1981

Robert C. Snare 30 Sep. 1981 5 p refs
(Contract N00014-77-C-0343; NR Proj. 323-004)
(AD-A111390) Avail: NTIS HC A02/MF A01 CSCL 08/14

The purpose of the contract was to develop, fabricate and test seven triaxial fluxgate magnetometer and digital data systems, for use in studying geomagnetic phenomonology. GRA

N82-25491# ARO, Inc., Arnold Air Force Station, Tenn.

AEROBALLISTICS RANGE PHOTOPYROMETRY Final Report, Oct. 1976 - Sep. 1978

P. H. Dugger, C. P. Enis, and R. E. Hendrix AEDC Feb. 1982 51 p refs
(AD-A111260; AEDC-TR-82-1) Avail: NTIS HC A04/MF A01 CSCL 16/3

The development of photopyrometry systems employing state-of-the-art image intensifiers has extended the lower limit for inflight nosetip surface temperature measurements on track-guided models in the hyperballistic range (G) to 1,250 K. Two recently developed types of photopyrometers are used to span the 1,250 K to 4,000 K temperature measurement range during reentry materials evaluation testing. Measurement uncertainty associated solely with the photopyrometry systems

is + or - 130 K or better for measurement of any temperature within this measurement range. GRA

N82-25492# International Atomic Energy Agency, Vienna (Austria). Dept. of Nuclear Medicine.
EVALUATION OF WEDGE-SHAPED PHANTOMS FOR ASSESSMENT OF SCANNER DISPLAY SYSTEMS AS PART OF QUALITY CONTROL OF SCANNER PERFORMANCE
Final Report, 15 Mar. 1980 - 14 Mar. 1981
H. Bergmann Mar. 1981 19 p
(DE81-700725; IAEA-R-2574-F) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Three types of phantom were developed and evaluated for the routine testing of display performance of moving-detector radionuclide scanners with particular reference to their background cut-off and contrast enhancement facilities. These were a transmission step-wedge phantom consisting of absorbers of different thickness, an emission step-wedge phantom consisting of a hollow Perspex container filled with radioactive solution and an emission continuous wedge phantom of similar construction. The emission phantoms are found superior to the transmission phantom in that they yielded higher information densities and the emission step-wedge phantom more convenient then the emission continuous wedge phantom in practice. Background cut-off could be tested by varying the cut-off level continuously while scanning a step. Contrast enhancement could be tested by repeated scanning of the wedge at different contrast level. Corresponding protocols for quality control tests were elaborated and are presented. DOE

N82-25493# Grenoble Univ. (France).
PATTERN RECOGNITION IN CALORIMETERS
M. Della-Negra Jul. 1980 39 p refs
(LAPP-EXP-07) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

A fast method to simulate calorimeter signals, based on an analytical parameterization of electromagnetic and hadronic showers is presented. Some reconstruction problems are discussed, in particular the question of disentangling individual showers within an energetic jet. DOE

N82-25494# Statens Provningsanstalt, Boraas (Sweden). Lab. for Physical Measurements.
REPORT ON WESTERN EUROPEAN METROLOGY CLUB (WEMC) THERMAL AUDIT PACK Th 3 Final Report
Jan Ivarsson 29 Sep. 1981 12 p
(SP-RAPP-1981:40) Avail: NTIS HC A02/MF A01

The thermoelectric voltages of a rhodium/platinum thermocouple, measured at temperatures between 600 and 1000 C by 10 laboratories, were compared with two reference values. Standard deviation is + or - 0.3 C at 600 C, and + or - 0.2 C at 1000 C. The mean value is within the inaccuracy bars of all the laboratories in a previous circulation. Author (ESA)

N82-25495# Oesterreichische Akademie der Wissenschaften, Vienna. Inst. of Space Research.
A LOW ENERGY PARTICLE SPECTROMETER WITH A LARGE GEOMETRIC FACTOR
A. Urban 1981 10 p refs Sponsored by Austrian Council for Science Research and Austrian Academy of Sciences
Avail: NTIS HC A02/MF A01

The design and calibration of a detector using a channel electron multiplier (CEM) together with a spherical electrostatic analyzer are described. The CEM characteristic equivalent energy bandwidths, opening angles and sensitive areas are defined and are given as functions of energies between 0.1 and 25 keV. The electronic part is described containing the analyzer deflection high voltage, the CEM acceleration high voltage, the measurement control unit, and the data processing interfaces. The numerical analysis of the geometric factor from the calibration data is demonstrated. Energy and pitch angle distribution measurements for energetic electrons are presented. The 90 deg sensor detects a nearly constant energy spectrum, while the 30 deg sensor exhibits large variations. The anomaly is attributed to the disappearance in the 30 deg sensor of the high precipitated flux component at middle energies after 156 sec flight time.
Author (ESA)

N82-25496# Danish Meteorological Inst., Copenhagen.
ABSOLUTE MEASUREMENTS WITH PROTON MAGNETOMETERS IN FIX COILS
E. Kring Lauridsen 1980 28 p refs
(DMI-Geophys-Papers-R-57; ISBN-87-7478-172-3) Avail: NTIS HC A03/MF A01

Proton magnetometer measurements using large fixed coils intended for magnetometric zero balance and quartz horizontal magnetometer calibration are described. Correction for the unknown component in the desired supplementary field in the coil is achieved by measuring the increment of the component in question by classical instruments, such as the silicon oil damped H variometer. Reference values for the horizontal component H, and the supplementary vertical field Z are obtained from direct reading variometers. The variometer formulas are rationalized to the form X = X circumflex + Delta X, Y = Y circumflex + Delta Y, Z = Z circumflex + Delta Z. Measurement of H Z and the constant of a vertical coil, H and Z with a vertical coil, and H and Z with a horizontal coil is illustrated. Results show accordance between the methods of measuring an element.
Author (ESA)

N82-25173# Hamilton Standard, Windsor Locks, Conn.
SOLID STATE CRASH SURVIVABLE FLIGHT DATA RECORDERS FOR MISHAP INVESTIGATION
H. R. Ask *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 33-68 refs (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

N82-25174# Sundstrand Data Control, Inc., Redmond, Wash.
NEW TECHNIQUES IN DATA RETRIEVAL AND DISPLAY
G. S. L. Benn *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 69-91 refs (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

N82-25177# Sundstrand Data Control, Inc., Redmond, Wash.
A NEW ALL-PURPOSE DIGITAL FLIGHT DATA RECORDER
P. H. Eason *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 131-158 ref (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

N82-25182# Societe de Fabrication d'Instruments de Mesure SFIM, Massy (France).
AN INTERMEDIATE SOLUTION BETWEEN BASIC AND EXPANDED AIRCRAFT INTEGRATED DATA SYSTEMS (AIDS)
Claude Robert *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 277-300 refs (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

N82-25183# Lockheed Aircraft Service, Inc., Ontario, Calif.
FLIGHT DATA RECOVERY UNDER ADVERSE CONDITIONS
E. J. Rosenbauer *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 301-322 ref (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

N82-25186# British Aluminum Co., Ltd., London (England).
GATHERING AND ANALYSING DATA ON THE BRITISH AIRWAYS BOEING 757 AIRCRAFT
Peter Waller *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 381-393 (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122,90

N82-25188# Leigh Instruments Ltd., Carleton Place (Ontario).
VALUE OF SURVIVABILITY AND RECOVERABILITY OF FLIGHT DATA RECORDERS
James W. Wells and W. Donald Wells *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 419-440 refs (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF ; DFVLR, Cologne DM 122,90

N82-26067*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PERFORMANCE OF SINGLE PHOTON-COUNTING X-RAY CHARGE COUPLED DEVICES
Guenter R. Riegler, R. A. Stern, K. Liewer, F. Vescelus, J. A. Nousek (Pennsylvania State Univ., State College), and Gordon P. Garmire (Pennsylvania State Univ., State College) *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 289-299 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 14B

N82-26068*# Columbia Univ., New York. Astrophysics Lab.
AN IMAGING GAS SCINTILLATION PROPORTIONAL COUNTER FOR THE DETECTION OF SUBKILOELECTRON-VOLT X-RAYS
Charles J. Hailey, William H.-M. Ku, and Michael H. Vartanian *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 301-318 refs (For primary document see N82-26055 16-88)
(Grant NGR-33-008-102)
Avail: NTIS HC A99/MF A01 CSCL 14B

N82-26069*# Massachusetts Inst. of Tech., Cambridge.
A WIDE-FIELD SOFT X-RAY CAMERA
Robert Petre *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 319-323 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 20F

N82-26074*# Wisconsin Univ. - Madison. Dept. of Physics.
A DIFFUSE SOFT X-RAY SPECTROMETER
Dan McCammon *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 379-401 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 14B

N82-26075*# Colorado Univ., Boulder. Lab. for Atmospheric and Space Physics.
REQUIREMENTS FOR HIGH QUALITY X-RAY SPECTROSCOPY IN AN EXPLORER CLASS MISSION
Webster C. Cash, Jr. *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 403-424 refs (For primary document see N82-26055 16-88)
(Grant NAG5-96)
Avail: NTIS HC A99/MF A01 CSCL 14B

N82-26076*# Massachusetts Inst. of Tech., Cambridge. Center for Space Research.
FUTURE PROSPECTS FOR HIGH RESOLUTION X-RAY SPECTROMETERS
Claude R. Canizares (Cambridge Univ.) *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 425-440 refs Sponsored in part by the Royal Society of England and the Alfred P. Sloan Foundation (For primary document see N82-26055 16-88)
(Contract NAS8-30752)
Avail: NTIS HC A99/MF A01 CSCL 14B

N82-26081*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
HIGH-RESOLUTION IRON-LINE SPECTROSCOPY
Richard E. Griffiths *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 497-522 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 14B

N82-26082*# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.
LABORATORY STUDIES ON A SPHERICALLY CURVED BRAGG SPECTROMETER FOR COSMIC X-RAY SPECTROSCOPY
M. Cantin, L. Koch-Miramond, B. Mougin, and R. rocchia *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980' Nov. 1981 p 523-526 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 14B

N82-26114# Oesterreichische Akademie der Wissenschaften, Vienna. Inst. for Space Research.
MAGNETIC FIELD MEASUREMENTS ON BOARD VENERA 13, VENERA 14 AND VENERA HALLEY
R. Schmidt and K. Schwingenschuh *In* ESA The Solar System and its Exploration Nov. 1981 p 245-247 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

36 LASERS AND MASERS

Includes parametric amplifiers.

N82-25497*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A SOLAR PUMPED LASER Patent Application
Ja H. Lee (Vanderbuilt Univ.), Frank Hohl, inventors (to NASA), and Willard R. Weaver Filed 4 Dec. 1981 16 p
(NASA-Case-LAR-12870-1; US-Patent-Appl-SN-327658) Avail: NTIS HC A02/MF A01 CSCL 20E

A solar pumped laser in which the lasant is a gas is described. The gas will photodissociate and lase when subjected to sunrays. Sunrays are collected and directed onto the gas lasant to cause it to lase. NASA

N82-25498*# Business and Technological Systems, Inc., Seabrook, Md.
COVARIANCE ANALYSIS OF THE AIRBORNE LASER RANGING SYSTEM Final Report
Thomas S. Englar, Jr., Carol L. Hammond, and Bruce P. Gibbs 18 Feb. 1981 42 p
(Contract NAS5-23715)
(NASA-CR-166805; NAS 1.26:166805) Avail: NTIS HC A03/MF A01 CSCL 20E

The requirements and limitations of employing an airborne laser ranging system for detecting crustal shifts of the Earth within centimeters over a region of approximately 200 by 400 km are presented. The system consists of an aircraft which flies over a grid of ground deployed retroreflectors, making six passes over the grid at two different altitudes. The retroreflector baseline errors are assumed to result from measurement noise, a priori errors on the aircraft and retroreflector positions, tropospheric refraction, and sensor biases. J.D.

N82-25499*# KMS Fusion, Inc., Ann Arbor, Mich.
FREE ELECTRON LASERS FOR TRANSMISSION OF ENERGY IN SPACE Final Report
S. B. Segall, H. R. Hiddleston, and G. C. Catella Oct. 1981 40 p refs
(Contract NAS3-22659)
(NASA-CR-165520; NAS 1.26:165520; KMSF-U-1185) Avail: NTIS HC A03/MF A01 CSCL 20E

A one-dimensional resonant-particle model of a free electron laser (FEL) is used to calculate laser gain and conversion efficiency of electron energy to photon energy. The optical beam profile for a resonant optical cavity is included in the model as an axial variation of laser intensity. The electron beam profile is matched to the optical beam profile and modeled as an axial variation of current density. Effective energy spread due to beam emittance is included. Accelerators appropriate for a space-based FEL oscillator are reviewed. Constraints on the concentric optical resonator and on systems required for space operation are described. An example is given of a space-based FEL that would produce 1.7 MW of average output power at 0.5 micrometer wavelength with over 50% conversion efficiency of electrical energy to laser energy. It would utilize a 10 m-long amplifier centered in a 200 m-long optical cavity. A 3-amp, 65 meV electrostatic accelerator would provide the electron beam and recover the beam after it passes through the amplifier. Three to five shuttle flights would be needed to place the laser in orbit. A.R.H.

N82-25500# Defense Intelligence Agency, Washington, D.C. Directorate for Scientific and Technical Intelligence.

BIBLIOGRAPHY OF SOVIET LASER DEVELOPMENTS, NUMBER 49, SEPTEMBER - OCTOBER 1980
Oct. 1981 130 p
(AD-A109153; DIA-DST-2700Z-004-81) Avail: NTIS HC A07/MF A01 CSCL 20/5

This is the Soviet Laser Bibliography for September - October 1980, and is No. 49 in a continuing series on Soviet laser developments. The coverage includes basic research on solid state, liquid, gas and chemical lasers; components; nonlinear optics; spectroscopy of laser materials; ultrashort pulse generation; crystal growing; theoretical aspects of advanced lasers; and general laser theory. Laser applications are listed under biological effects; communications; beam propagation; computer technology; holography; laser induced chemical reactions; measurement of laser parameters; laser measurement applications; laser excited optical effects; laser spectroscopy; beam target interaction; and plasma generation and diagnostics. Author (GRA)

N82-25501# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
LASER JOURNAL (SELECTED ARTICLES)
12 Feb. 1982 36 p refs Transl. into ENGLISH of Laser J. (China), v. 8, no. 1, 1981 p 5-9, 10-13, 18-20, 47-48
(AD-A111944; FTD-ID(RS)T-1390-81) Avail: NTIS HC A03/MF A01 CSCL 20/5

A collection of articles on laser application and technology is presented. The following topics are discussed: effects of thermal deformation in mirrors on resonator parameters; folded resonator for high power lasers; copper vapor laser; experiments and research of electron beam control XeCl quasimolecule laser. E.A.K.

N82-25502# Stanford Univ., Calif. High Temperature Gasdynamics Lab.
ADVANCED DIAGNOSTICS AND INSTRUMENTATION FOR CHEMICALLY REACTIVE SYSTEMS Interim Scientific Report, 1 Sep. 1980 - 30 Sep. 1981
R. K. Hanson, D. Baganoff, C. T. Bowman, R. L. Byer, B. J. Cantwell, and S. A. Self Sep. 1981 53 p refs
(Contract F49620-80-C-0091; AF Proj. 2308)
(AD-A111912; AFOSR-82-0105TR) Avail: NTIS HC A04/MF A01 CSCL 20/5

Progress is reported for the first year of an interdisciplinary program to investigate and develop modern diagnostic techniques for application to reacting flows. Project areas include: (1) development and application of optical probes for species measurements employing tunable ultraviolet, visible and infrared laser sources; (2) development and application of a coherent anti-Stokes Raman spectroscopy (CARS) system for temperature and velocity measurements in a supersonic jet; (3) development of a computed absorption tomography system for species measurements in a plane using a tunable laser source; (4) development of a fast-response temperature monitor, based on line-reversal concepts, applicable to particle-laden high temperature flows; (5) investigation of new quantitative flow visualization concepts, including temporally and spatially resolved species measurements in a plane using laser-induced fluorescence; (6) application of modern diagnostic techniques to a two-dimensional reacting shear layer; (7) development of measurement techniques and a novel facility for investigations of droplet evaporation in turbulent flows; (8) investigation of novel variations of tunable laser absorption spectroscopy yielding spatial resolution, including saturation spectroscopy and ac-Stark effect modulation spectroscopy. Author (GRA)

N82-25503# Naval Research Lab., Washington, D. C. Plasma Theory Branch.
COLLECTIVE EFFECTS ON THE OPERATION OF FREE ELECTRON LASERS WITH AN AXIAL GUIDE FIELD Interim Report
H. P. Freund (Science Applications, Inc., McLean, Va.), P. Sprangle, D. Dillenburg, E. H. daJornada, R. S. Schneider, and B. Liberman 19 Feb. 1982 41 p refs Prepared in cooperation with Federal Univ. of Rio de Janeiro
(WF32389592)
(AD-A111455; NRL-MR-4763) Avail: NTIS HC A03/MF A01 CSCL 20/5

The collective interaction in a free electron laser with combined helical wiggler and uniform axial guide fields is presented in the linearized regime. The analysis involves a perturbation of the Vlasov-Maxwell equations about the constant-velocity helical trajectories, and the general driving currents are derived for this configuration. The complete dispersion equation is then obtained for a monoenergetic beam. Analytic solutions are obtained in the strong pump and a space-charge dominated regimes, and an extensive numerical analysis is presented for a wide range of operating parameters. The results indicate that substantial enhancements in the gain are possible when the relativistic axial gyrofrequency is comparable to the Free Electron Laser Doppler Upshift. In addition, there is a range of parameters for which the ponderomotive potential acts to destabilize the electron beam. In this regime, we find both unstable electrostatic beam modes and largely electromagnetic modes with broad bandwidths. Author (GRA)

N82-25504# Naval Research Lab., Washington, D. C.
THE EFFECT OF FLUCTUATING SPACE CHARGE FIELDS ON SIDEBAND INSTABILITIES IN FREE ELECTRON LASERS Interim Report
H. P. Freund, P. Sprangle, and C. M. Tang 22 Oct. 1981 34 p refs
(DARPA Order 3817)
(AD-A111160; NRL-MR-4656) Avail: NTIS HC A03/MF A01 CSCL 20/5

We consider the sideband instabilities that can occur in free electron lasers which operate in the regime where the bulk of the energetic electron beam is trapped in the ponderomotive potential generated by the beating of the electromagnetic pulse with the static wiggler field. The general dynamical equations which govern the evolution of the system in the presence of sideband modes are derived for modes propagating along the axis of symmetry. All space-charge effects are included in a self-consistent manner, and the gains for both the primary signal and the upper and lower sidebands are computed. We find the lower sideband to be excited, and discuss the consequences for operation of both free electron laser amplifiers and oscillators. The effect of the space-charge waves on the gain depends upon the number of bounces undergone by the trapped electrons in the length of the system, and can act either to enhance or reduce the gain of the sideband. Author (GRA)

N82-25505# Sanders Associates, Inc., Nashua, N. H. Defensive Systems Div.
EYESAFE LASER TRANSCEIVER Final Report, Sep. 1979 - Jul. 1981
M. G. Knights Nov. 1981 54 p
(Contract DAAK20-79-C-0034)
(AD-A111340) Avail: NTIS HC A04/MF A01 CSCL 20/5

This final report details the work carried out to design, fabricate and test a brassboard 1.73 micrometer eyesafe transceiver. The objective of the program was to develop a compact, efficient 1.73 micrometer Er:YLF laser and to couple the laser to a Germanium photodiode receiver. On this program 10-30mJ of Q-switched 1.73 micrometer laser output was obtained, for pump energies of 20-30 Joules, from a compact Er:YLF laser. Repetitively pulsed Q-switched laser operation was maintained for 10 seconds without significant loss of output. The laser was coupled to a germanium photodiode receiver and ranging was demonstrated, with high S/N, to a variety of non-cooperative targets at ranges of 1-2Km; projected ranging capability is 4-5Km. The brassboard transceiver was delivered to the Night Vision Laboratory. Author (GRA)

N82-25506# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
HARDWARE AND SOFTWARE INTEGRATION FOR CONCURRENT DATA ACQUISITION AND REDUCTION OF PHOTON CORRELATED LASER DOPPLER VELOCIMETRY M.S. Thesis
David L. Neyland Dec. 1981 139 p refs
(AD-A111146; AFIT/GA/AA/81D-10) Avail: NTIS HC A07/MF A01 CSCL 14/2

A general Automatic Data Acquisition System dedicated to a broad range of experiments is used to operate the Digital Correlation signal processing equipment of a Laser Doppler Velocimeter, transfer data from the correlator into the Automatic

Data Acquisition System computer and perform computations with the information. The Laser Doppler Velocimeter is used to acquire vast quantities of velocity and turbulence intensity information describing turbulent fluid flow about two dimensional airfoils. Integration of the velocimeter with the computer increases the capability of the system to perform large scale fluid dynamic studies. GRA

N82-25507# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

INVESTIGATION OF LASER INDUCED FLUORESCENCE FOR CONCENTRATION MEASUREMENTS OF DIATOMIC SULFUR M.S. Thesis

Tyrie R. Robbins Dec. 1981 73 p refs
(AD-A111141; AFIT/GEP/PH/81D-8) Avail: NTIS HC A04/MF A01 CSCL 20/10

This thesis investigated the feasibility of using laser induced fluorescence to measure S2 number densities in a laboratory environment. The research was prompted by the growing interest in S2, especially its potential as a tunable, high-power laser medium. In concept, laser induced fluorescence proved to be a feasible means of measuring S2 concentrations in a laboratory environment. Differences between the known and calculated number densities are attributed to the complexity of S2, quenching and radiation trapping, difficulties in measuring the effective lifetime, and inadequacies in the rate equation model. GRA

N82-25508# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

CHARACTERIZATION OF AN HF PUMPED CO2 LASER M.S. Thesis

Glen Paul Perram Oct. 1981 163 p refs
(AD-A111140; AFIT/GEP/PH/81D-7) Avail: NTIS HC A08/MF A01 CSCL 20/5

The purpose of this study was to characterize the performance of an optically pumped molecular laser and determine the effect of pump frequency on output power. Specifically, the P2(6) transition in a chemical HF laser is used to pump 12C1802 molecules from the ground state to the 101 vibrational energy level. A population inversion is established between the 101 and 100 energy levels and lasing action is achieved at 4.3 microns. The results of a theoretical analysis and an experimental study are used to maximize the system's performance, clarify the principles of operation, and to resolve discrepancies between theory and prior experimental observations. GRA

N82-25509# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

OBSERVATION AND ANALYSIS OF LiCa AND LiMg EXCIMERS Ph.D. Thesis

David K. Neumann Aug. 1981 144 p refs
(AF Proj. 3326)
(AD-A111137; AFIT/DS/PH/80-3) Avail: NTIS HC A07/MF A01 CSCL 20/5

Emission from LiCa and LiMg excimers was obtained for the first time upon pumping mixtures of Li and Ca vapors and Li and Mg vapors with an Ar+ laser. The emission spectra were analyzed spectroscopically and found to be in good agreement with a synthetic spectrum derived from ab initio calculations of the LiMg and LiCa potential energy curves. A kinetic model was developed to explain the LiMg formation process. The kinetics of production of LiMg were analyzed by time delay measurements and efficiency measurements of the fluorescence intensity. GRA

N82-25510# Naval Postgraduate School, Monterey, Calif. Dept. of Physics and Chemistry.

DISTRIBUTED APERTURES IN LAMINAR FLOW LASER TURRETS M.S. Thesis

Brian Brocks Tousley Sep. 1981 49 p refs
(AD-A110818; NPS67-81-014) Avail: NTIS HC A03/MF A01 CSCL 20/6

Assume a technology that permits undistorted laser beam propagation from the aft section of a streamlined turret. A comparison of power on a distant airborne target is made between a single aperture in a large scale streamlined turret with a turbulent boundary layer and various arrays of apertures in small scale streamlined turrets with laminar flow. The array performance is mainly limited by the size of each aperture. From an array one might expect, at best, about 40 percent as much power on the target as from a single aperture with equal area. Since the turbulent boundary layer on the large single-turret has negligible effect on beam quality, the array would be preferred (if all development efforts were essentially equal) only if a laminar wake is an operational requirement. Author (GRA)

N82-25511# Helsinki Univ. (Finland). Research Inst. for Theoretical Physics.

THE THEORY OF LASER ANNEALING OF DISORDERED SEMICONDUCTORS

M. Noga 1980 15 p refs
(HU-TFT-80-25; ISBN-951-45-2039-4) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The disorder-order phase transition concerning the ion implanted Si pulsed laser annealing is explained. The phase transition is related to the Bose condensation of electron hole plasmons. DOE

N82-25512# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.

LASER RANGE AND RANGE RATE FINDER. STUDY AND DEVELOPMENT OF CRITICAL TECHNOLOGIES. VOLUME 1: LASER DIODE RANGE FINDER

C. Diehl, T. Halldorsson, B. Kunkel, E. Lill, S. Manhart, G. Sepp, D. Siemsen, and K. Thalmair Paris ESA Jun. 1981 122 p refs 2 Vol.
(Contracts ESTEC-4323/80/NL-HP(SC); MBB-R3700/2510R) (MBB-UR-479-81-Vol-1; ESA-CR(P)-1527-Vol-1) Avail: NTIS HC A06/MF A01

Performance analysis and concept description of laser diode optical radar systems for precision tracking and ranging between spaceborne targets are presented. Intersatellite ranging for determining gravity disturbances on satellite orbits and range measurement for spacecraft rendezvous and docking maneuvers support are considered. Both tasks can be performed, according to theoretical studies, using diode laser systems. A ground based continuous wave (CW) laser diode ranging system was successfully tested as a first step towards creating a functional model of a spaceborne unit. For the intersatellite mission, a combination of pulsed and CW systems is proposed, that is a pulsed laser for rapid scanning and coarse ranging and a CW laser for precision ranging. Both systems are suitable for rendezvous or docking maneuvers. Author (ESA)

N82-25513# ASULAB S.A., Neuchatel (Switzerland). Groupe Laser-Optique.

LASER RANGE AND RANGE RATE FINDER. STUDY AND DEVELOPMENT OF CRITICAL TECHNOLOGIES. VOLUME 2: CO2 LASER FOR RANGE RATE MEASUREMENT

Peter Spring and Juerg Steffen Paris ESA Aug. 1981 35 p refs 2 Vol.
(Contracts ESTEC-4323/80/NL-HP(SC); MBB-R3700/2510R) (MBB-UR-477-81-Vol-2; ESA-CR(P)-1527-Vol-2) Avail: NTIS HC A03/MF A01

Breadboard studies of CO2 optical Doppler radar subunits for spaceborne range measurement, target acquisition and tracking are reported. Laser oscillator, stabilization gas absorption cell, and optical stabilization loop concepts are discussed. Test results show that the oscillator and the optical elements must be improved before stabilization experiments with the gas cell can begin. The oscillator must be adapted to operation without water and gas-flow, and suitable grating must be used as end mirror. The optical isolation between laser and gas cell must be improved, for instance by inserting the acoustooptic modulator and by using polarization independent beam folding mirrors. Anodized aluminum pieces in the SF6 cell must be reworked with respect to the Al2O3 layer. Author (ESA)

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N82-25514*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FRICTIONAL HEATING DUE TO ASPERITY INTERACTION OF ELASTOHYDRODYNAMIC LINE-CONTACT SURFACES
Bankim C. Majumdar and Bernard J. Hamrock May 1982 23 p refs Presented at the ASME-ASLE Joint Lubrication Conf., New Orleans, 5-7 Oct. 1981
(NASA-TP-1882; E-897; NAS 1.60:1882) Avail: NTIS HC A02/MF A01 CSCL 20K

A numerical solution of an elastohydrodynamically lubricated (EHL) line contact between two long, rough-surface cylinders that considers the frictional heating of asperities was obtained. Pressure distribution, temperature distribution, film thickness and EHL load for given speeds, lubricant properties, material properties of surfaces, and surface roughness parameters were theoretically solved by simultaneous solution of the elasticity equation and the Reynolds equation for two partially lubricated rough surfaces. The pressure due to asperity contact was calculated by assuming a Gaussian distribution of surface irregularities. The elastic deformation used for film thickness computation was found from the two kinds of pressure by plane strain analysis. The temperature rise in the contact zone was calculated by using the Blok-Jaeger flash temperature model. The effects of surface roughness on EHL load for various slide-role ratios, surface roughness parameters, surface patterns, and temperature parameters was studied. It was found that the maximum temperature rise in most cases occurred in the inlet zone, and that the minimum film thickness decreased and the maximum temperature increased as the surface roughness was increased. Author

N82-25515# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service Office.
ON THE USE OF GRINDING WHEELS COATED WITH DIAMOND OR CUBIC BORON NITRIDE IN THE MANUFACTURE OF HARD METAL AND HARDENED STEEL WEARING COMPONENTS
H. Meyer and F. M. Friedrich 1981 9 p Transl. into ENGLISH from Ind. Diamanten Rundschau (W. Germany), v. 15, no. 2, 1981
(CSIR-Trans-1599) Avail: NTIS HC A02/MF A01

Because hard metal may be machined by flat, profile, external and internal grinding and also by coordinated grinding techniques, the use of diamond grinding wheels is assuming increasing importance. A good range of high performance machines is a precondition for the effective use of diamond grinding wheels. The various machining stages are carried out on, among other things, profile grinding machines, some of which are equipped with optical indexing heads, triple axis CNC controlled full cut grinding machines, and high capacity Studer profiling machines. The manufacture of hard metal cutting segments and the grinding of a wearing component for the electronic industry are described. A.R.H.

N82-25516*# Illinois Univ., Chicago. Dept. of Materials Engineering.
MATHEMATICAL MODELS FOR THE SYNTHESIS AND OPTIMIZATION OF SPIRAL BEVEL GEAR TOOTH SURFACES Final Report
F. L. Litvin, Pernez Rahman, and Robert N. Goldrich Jun. 1982 122 p refs
(Grant NAG3-48)
(NASA-CR-3553; NAS 1.26:3553) Avail: NTIS HC A06/MF A01 CSCL 13I

The geometry of spiral bevel gears and to their rational design are studied. The nonconjugate tooth surfaces of spiral bevel gears are, in theory, replaced (or approximated) by conjugated tooth surfaces. These surfaces can be generated by two conical surfaces, and by a conical surface and a revolution. Although these conjugated tooth surfaces are simpler than the actual ones, the determination of their principal curvatures and directions is still a complicated problem. Therefore, a new approach, to the solution of these is proposed. Direct relationships between the principal curvatures and directions of the tool surface and those of the generated gear surface are obtained. With the aid of these analytical tools, the Hertzian contact problem for conjugate tooth surfaces can be solved. These results are useful in determining compressive load capacity and surface fatigue life of spiral bevel gears. A general theory of kinematical errors exerted by manufacturing and assembly errors is developed. This theory is used to determine the analytical relationship between gear misalignments and kinematical errors. This is important to the study of noise and vibration in geared systems. S.L.

N82-25517*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
UNITARY SEAL RING ASSEMBLY Patent Application
William N. Myers and Leopold A. Hein, inventors (to NASA) Filed 13 May 1982 10 p
(NASA-Case-MFS-25678-1; US-Patent-Appl-SN-378533) Avail: NTIS HC A02/MF A01 CSCL 11A

A ring seal is installed in an annular recess for sealing the interface between the housing and a rotating or reciprocating shaft. The seal ring consists of a resilient and member having a metal ring wedge acting on it by a Belleville spring. The ring wedge has an elongated, annular projecting rib on each sloping side surface which projects into elongated annular slots along the sides forming the recess in the cup. The parts can be interlocked before installation in a unitary manner. NASA

N82-25518*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LUBRICATION OF RIGID ELLIPSIDA SOLIDS
Bernard J. Hamrock and Duncan Dowson (Leeds Univ., Engl.) May 1982 55 p refs
(NASA-TM-81694; E-209; NAS 1.15:81694) Avail: NTIS HC A04/MF A01 CSCL 13I

The influence of geometry on the isothermal hydrodynamic film separating two rigid solids was investigated. The minimum film thickness is derived for fully flooded conjunctions by using the Reynolds boundary conditions. It was found that the minimum film thickness had the same speed, viscosity, and load dependence as Kapitza' classical solution. However, the incorporation of Reynolds boundary conditions resulted in an additional geometry effect. Solutions using the parabolic film approximation are compared by using the exact expression for the film in the analysis. Contour plots are known that indicate in detail the pressure developed between the solids. Author

N82-25519*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FILM SHAPE CALCULATIONS ON SUPERCOMPUTERS
Bernard J. Hamrock 1982 10 p refs Proposed for presentation at the Joint Lubrication Conf., Washington, 4-6 Oct. 1982
(NASA-TM-82856; E-1225; NAS 1.15:82856) Avail: NTIS HC A02/MF A01 CSCL 09B

Both scalar and vector operations are described to demonstrate usefulness of supercomputers (computers with peak computing speeds exceeding 100 million operative per second) in solving tribological problems. A simple kernel of the film shape calculations in an elastohydrodynamic lubricated rectangular contact is presented and the relevant equations are described. Both scalar and vector versions of the film shape code are presented. The run times of the two types of code indicate that over a 50-to-1 speedup of scalar to vector computational time for vector lengths typically used in elastohydrodynamic lubrication analysis is obtained. A.R.H.

N82-25520*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LUBRICANT EFFECTS ON EFFICIENCY OF A HELICOPTER TRANSMISSION
Andrew M. Mitchell and John J. Coy 1982 16 p refs Presented at the AGARD Symp. on Probl. in Bearings and Lubrication, Ottawa, Canada, 31 May - 4 Jun. 1982
(NASA-TM-82857; E-1226; NAS 1.15:82857; AVRADCOM-TR-82-C-9) Avail: NTIS HC A02/MF A01 CSCL 01C

Eleven different lubricants were used in efficiency tests conducted on the OH-58A helicopter main transmission using the NASA Lewis Research Center's 500 hp torque regenerative helicopter transmission test stand. Tests were run at oil-in temperatures of 355 K and 372 K. The efficiency was calculated from a heat balance on the water running through an oil to water heat exchanger which the transmission was heavily insulated. Results show an efficientcy range from 98.3% to 98.8% which is a 50% variation relative to the losses associated with

the maximum efficiency measured. For a given lubricant, the efficiency increased as temperature increased and viscosity decreased. There were two exceptions which could not be explained. Between lubricants, efficiency was not correlated with viscosity. There were relatively large variations in efficiency with the different lubricants whose viscosity generally fell in the 5 to 7 centistoke range. The lubricants had no significant effect on the vibration signature of the transmission. A.R.H.

N82-25521# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.

CHEM-BRAZE ABRADABLE SEAL ATTACHMENT TO AIRCRAFT GAS TURBINE COMPRESSOR COMPONENTS

Final Report, 1 Nov. 1979 - 31 Sep. 1980

Stephen T. Narsavage, Saed Safai, and Harold W. Pettit, Jr. St. Louis Army Aviation Research and Development Command Jan. 1982 71 p

(Contract DAAG46-79-C-0102)

(AD-A111692; PWA-FR-13975; USAAVRADCOM-TR-82-F-2; AMMRC-TR-82-6) Avail: NTIS HC A04/MF A01 CSCL 11/2

Manufacturing methods were established for bonding an abradable seal surface onto the stationary compressor element of small gas turbine engines utilizing an easily replaceable Chem-Braze bond system. Bonded specimens were prepared and evaluated in vibration and rub incursion tests. Tooling was fabricated for bonding a seal to Army supplied engine hardware, and NDI methods were established for inspecting bond integrity. Chemical stripping techniques for removing Chem-Braze attached seals were optimized to permit efficient refurbishment of severely worn seals. An economic analysis indicated significant cost savings for attaching abradable seals to compressor blade tip shrouds using the improved Chem-Braze system compared to attachment with gold-nickel braze. The Chem-Braze system has been used successfully to bond abradable seals to titanium, cobalt, nickel and iron base alloys; however, attempts to use Chem-Braze to bond seals to selected aluminum and magnesium alloys were not successful. Author (GRA)

N82-25522# Vought Corp., Dallas, Tex.

DYNAMIC SEALS FOR ADVANCED HYDRAULIC SYSTEMS

Final Technical Report, 1 Jul. 1978 - 31 Mar. 1981

Robert B. Olsen Wright-Patterson AFB, Ohio AFWAL Aug. 1981 307 p refs

(Contract F33615-78-C-2027; AF Proj. 3145)

(AD-A111996; AFWAL-TR-81-2066) Avail: NTIS HC A14/MF A01 CSCL 01/3

The purpose of this program was to identify rod seals and scrapers which would give long service life in fly-by-wire (FBW) flight control system actuators. This project determined a duty cycle spectrum for FBW flight control actuators. Realistic testing of rod seals and scrapers in a -65 to +275 F, 3000 psi, MIL-H-5606 fluid system identified a number of rod seals and scrapers which gave improved performance when compared to a baseline rod seal of MS28774 backups/M83461/1 O-ring or a MS28776M scraper. The rod seal tests evaluated backup rings, single stage, and two stage rod seals of many configurations. Scrapers were tested in an AC coarse test dust environment at 170 to 190 F. Principle conclusions for rod seals are that two stage unvented rod seals offer a significant reduction in leakage when compared to any single stage rod seal. With the use of a high performance backup ring, O-rings are capable of withstanding the equivalent of 5 years service life in FBW mechanical duty cycles. Single stage rod seals with rubber in contact with the rod leak much less than those with plastic in contact with the rod. Four different two stage rod seal systems were identified which gave no measurable external leakage in tests. Five plastic and one bronze scraper were tested which allowed less transmission of contaminant to the rod seal than the MS28776M baseline. Author (GRA)

N82-25523# Mason and Hanger-Silas Mason Co., Inc., Amarillo, Tex.

COMPUTER PROGRAM FOR SKID TEST DATA ANALYSIS

Robert W. Ashcraft Oct. 1981 45 p

(Contract DE-AC04-76DP-00487)

(DE82-002571; MHSMP-81-43) Avail: NTIS HC A03/MF A01

A computer program for analysis of instrumented skid test data has been developed for the HP9845T. Output from the two accelerometers is recorded by a waveform recorder and transferred to magnetic tape by an HP9835 at the firing site. Calibration data for the two channels are also stored on the magnetic tape which serves as input for the analysis program. The program converts the accelerometer output to actual acceleration units, computers the normal and rotational accelerations, performs the standard skid test analysis, produces a standard printout and plots, and stores the information in a historical file on flexible disk. The program is written in HP Basic and requires 60 kbytes of memory. A program listing and sample data case are included. DOE

N82-25524# General Electric Co., St. Petersburg, Fla. Neutron Devices Dept.

COMPUTER CONTROLLED TUBE BRAZE STATION

J. F. Howell 30 Oct. 1981 8 p

(Contract DE-AC04-76DP-00656)

(DE82-003317; GEPP-TIS-616) Avail: NTIS HC A02/MF A01

A vacuum tube braze station was developed that automatically performs all the process steps necessary to braze molybdenum vacuum tube components in a hydrogen atmosphere. A microcomputer controller provides for rapid and flexible programming of the process. A closed loop temperature control system provides precise repeatability of the braze time/temperature profile resulting in an increased yield of good tubes. The station provides the following significant features: (1) fully automatic flush and braze cycle; (2) complete flexibility to vary the process; (3) consistent repeatability of braze joints; (4) ease of operation; and (5) little operator training or skill required. In addition, one operator handles the preparation of tube components for brazing, and also the brazing operation. These two functions previously required two operators. DOE

N82-25525# General Electric Co., St. Petersburg, Fla. Equipment Engineering Dept.

VACUUM TUBE AUTOMATIC WELD STATION

J. F. Howell 6 Nov. 1981 8 p

(Contract DE-AC04-76DP-00656)

(DE82-003314; GEPP-TIS-608) Avail: NTIS HC A02/MF A01

A microcomputer controlled tube welding station was developed that significantly improves the productivity of the process by providing fully automatic operation and improved weld quality. In addition, the microcomputer allows easy changing of the process to study and determine the optimum weld cycle parameters. The weld station provides the following significant features: (1) fully automatic flush and weld cycle; (2) complete flexibility to vary the process; (3) consistently repeatable welds; (4) ease of operation; and (5) little operator training or skill required. DOE

N82-25526# National Centre of Tribology, Risley (England). European Space Tribology Lab.

THERMAL VACUUM QUALIFICATION LEVEL AND ACCELERATED LIFE TESTS OF A DORNIER SYSTEMS QUALIFICATION MODEL ANTENNA POINTING MECHANISM

J. C. Anderson Paris ESA Jun. 1981 51 p

(Contract ESA-3426/77/NL-MD)

(ESA-ESTL-048; ESA-CR(P)-1525) Avail: NTIS HC A04/MF A01

A double gimbal carbon fiber reinforced plastic APM with a friction-type stepping motor, driving each axis directly, was tested. Range of rotation, steady state pointing, pointing accuracy, mean motor step size, and zero shift were examined. Pointing accuracy is consistent over a wide thermal range. Accelerated life test performance is good. Displayed resolver backlash errors due to incorrect displaying of the electronics at changes in direction of APM rotation, and a reversible shift in the APM zero position with temperature are recorded. Variations in mean motor step size with temperature and torque are observed, but these do not affect APM performance. Author (ESA)

N82-25527# National Centre of Tribology, Risley (England). European Space Tribology Lab.

TORQUE/SPEED INVESTIGATIONS ON BALL BEARINGS

FOR REACTION WHEELS
K. T. Stevens Paris ESA 1981 35 p refs Sponsored by ESA
(ESA-ESTL-045; ESA-CR(P)-1529) Avail: NTIS HC A03/MF A01

The torque behavior from 0 to 4500 rpm of angular contact bearings (15 mm and 20 mm bore) with respect to lubricant type, lubricant quantity and cage design was investigated. With 15mm bearings, torque rises with increasing speed for all the test oils and little effect of cage design is observed. With 20 mm bearings, KG80 and Fomblin Z25 oil give pronounced torque minima at high speeds and the torque/speed graph is a function of the cage design. Inner race riding cages can give rise to incomplete elastohydrodynamic (EHD) lubrication. The triester oil BP135 does not provide complete EHD lubrication at any speed up to 4500 rpm with either bearing size. Results for KG80 and Z25 in 20 mm bearings are anomalous; torque minima are also observed at intermediate speeds. Author (ESA)

N82-25528# National Centre of Tribology, Risley (England). Space Tribology Lab.
THE FRICTION AND WEAR PROPERTIES OF SOME PROPRIETARY MOLYBDENUM DISULPHIDE SPRAY LUBRICANTS IN SLIDING CONTACT WITH STEEL
A. Thomas Paris ESA Feb. 1982 42 p refs
(Contract ESTEC-4099/NL-PP)
(ESA-ESTL-50; ESA-CR(P)-1537) Avail: NTIS HC A03/MF A01

Sliding tests performed on a pin-on-disk rig in a clean room and in vacuum showed that Molykote 106 and Everlube 811 perform well in air and vacuum, so lubrication and wear mechanisms were studied in further tests on Molykote. The test was interrupted at regular intervals and pin and coated disk wear was estimated quantitively. Results indicate three distinct stages in lubrication: (1) the lubricant coating supports the applied load entirely, a film of material being sheared between the bulk of the coating and the steel pin; (2) The metallic contact and wear occur between the pin and the disk asperity peaks, lubrication being provided by a thin film (0.2 to 0.5 microns thick) of lubricant between the pin and the worn asperity contact zones; and (3) failure occurs after the lubricant supply from the valleys between the asperity peaks becomes insufficient to prevent steel-on-steel contact and adhesive wear. Author (ESA)

N82-25529# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.
SLIP CONTROLLED WHEEL SETS FOR HIGH SPEED RAILWAY TRUCKS [SCHLUPFGEREGELTE RADSAETZE FUER HOCHGESCHWINDIGKEITSDREHGESTELLE]
Christian Guenther, Helmut Hassel, and Rolf Leo 1981 6 p In GERMAN Presented at 7th Intern. Radsatz-Kongr., Vienna, 25-29 Oct. 1981
(MBB-UD-325-81-O) Avail: NTIS HC A02/MF A01

High speed performance of railway trucks was considered. At 300 km/hr, conventional rigid axles are found unsafe due to the effect of curves on momentum transfer characteristics between two wheels. Active control of momentum transfer was studied. A slip controlled differential design is proposed. Engineering models of slip controlled wheel sets were built and tested. Optimized momentum coupling coefficients are obtained with this equipment. Author (ESA)

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N82-25530# Stanford Univ., Calif. Lab. of Physics.
RESEARCH ON NONDESTRUCTIVE TESTING Annual Report, 1 Sep. 1980 - 31 Aug. 1981
G. S. Kino Nov. 1981 62 p refs
(Contract F49620-79-C-0217)
(AD-A110525; GL-3363; AFOSR-82-0030TR) Avail: NTIS HC A04/MF A01 CSCL 20/1

Our aim has been to develop more rapid methods of NDE, as well as quantitative techniques for determining the parameters such as stress and microstructure associated with different types of materials, in particular steels. The imaging work has made a great deal of progress. The digital imaging system is now working well. We have used a number of different modes of propagation to make quantitative observations of cracks. We have developed special-purpose transducer arrays, for instance, a contacting shear wave array, a contacting longitudinal wave array, and array systems suitable for pitch/catch operation. New collocation theoretical techniques have been developed for determining the stress field around a crack in a semi-infinite half-space. These have proven extremely useful to the rest of our program as an input on which to check experiments and other theoretical techniques. They are also of fundamental importance to the theory of scattering of acoustic waves from cracks. We have used attenuation techniques, velocity measurement techniques with bulk waves and surface waves for determining near-surface microstructure, and we have developed new theoretical methods for this purpose. Energy integrals associated with a crack have been measured by acousto-elastic techniques, and we are trying to develop further methods using shear waves to obtain more experimental information on the various types of energy integrals. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N82-25531# Council for Scientific and Industrial Research, Pretoria (South Africa).
INVESTIGATION OF STRESS CONDITIONS IN CARBIDE HIGH PRESSURE ASSEMBLIES
A. S. Cybenko 1981 7 p refs Transl. into ENGLISH from Sineticeskie Almazy (USSR), no. 2, 1979 p 15-18
(CSIR-Trans-1602) Avail: NTIS HC A02/MF A01

Assemblies containing two block matrixes with recesses forming a cavity into which a vessel containing a reaction mixture was placed were used in synthesizing superhard materials such as diamond and cubical boron nitride. In order to achieve improved construction and efficiency, it is essential that the stress conditions of the components of the assembly be taken into consideration. It was assumed that the assemblies behave elastically where they are subject to high pressures. In this case determination of the stress conditions in the assemblies represents an axially symmetrical problem of elasticity theory. The method of final elements was used in calculating assembly stress conditions. T.M.

N82-25532*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
STRUCTURAL DYNAMICS ANALYSES TESTING AND CORRELATION
T. K. Caughey 1 May 1982 59 p refs
(Contract NAS7-100)
(NASA-CR-168993; JPL-Pub-81-72; NAS 1.26:168993) Avail: NTIS HC A04/MF A01 CSCL 20K

Some aspects of the lack of close correlation between the predictions of analytical modeling of dynamic structures and the results of vibration tests on such structures are examined. Ways in which the correlation may be improved are suggested. Author

N82-25533# National Physical Lab., Teddington (England). Div. of Information Technology and Computing.
NUMERICAL DETERMINATION OF THE CONFIGURATION OF AN UNDERWATER UMBILICAL SUBJECTED TO STEADY HYDRODYNAMIC LOADING. PART 2: UNSTEADY ASPECTS
D. H. Feriss Mar. 1982 36 p refs Sponsored by Dept. of Energy
(NPL-DITC-2/82; OT-R-8207; SSN-0143-7348) Copyright. Avail: NTIS HC A03/MF A01

A numerical model of the equilibrium of a flexible, inelastic underwater umbilical subject to hydrodynamic and gravity loading is extended to describe the motion of an umbilical-submersible system in which the submersible is driven by known forces varying with time. A tridiagonal matrix approach results. A three-dimensional case which ignores the inertia effects of the umbilical and a two-dimensional case which includes them are treated. For two dimensions, the partial differential equations representing the umbilical are of mixed hyperbolic-parabolic form requiring the development of a special numerical treatment for their solution. The unsteady model is more accurate than the steady one, but it is still unable to cope with conditions which force closing of a downward hanging umbilical loop. The Chebyshev technique is suggested here instead. Author (ESA)

N82-25534# Syracuse Univ., N. Y. Dept. of Chemical Engineering and Materials Science.

ELASTIC-PLASTIC DEFORMATION IN CRACKED SOLIDS AND DUCTILE FRACTURE Final Report, 1 Jun. 1978 - 31 Dec. 1981

H. W. Liu Jan. 1982 74 p refs

(Grants DAHC04-74-G-0165; DAA629-76-G-0290; DAAG29-78-G-0069)

(AD-A110805; ARO-15226.3-E) Avail: NTIS HC A04/MF A01 CSCL 20/11

The main objectives of the program are to study crack tip stresses and crack tip deformation, and to use the findings of these studies to investigate the fractures of ductile and tough materials. Crack tip displacement and strain fields were measured with the moire method, and crack tip stress, displacement, and strain fields were calculated with the finite elements method. The measured displacement and strain fields agree well with the finite element calculations. The results were used to develop the direct correspondence method of evaluating fracture toughness of ductile tough materials and were also to analyze deformation mode of fatigue crack growth. Author (GRA)

N82-25535# Washington Univ., Seattle. Dept. of Aeronautics and Astronautics.

STRESS FIELD EFFECTS ON DYNAMIC FRACTURE Final Report, Sep. 1977 - Oct. 1981

Ian M. Fyfe Dec. 1981 19 p refs

(Contract DAAG29-80-C-0128; Grant DAAG29-77-G-0211)

(AD-A110779; ARO-15078.4-E) Avail: NTIS HC A02/MF A01 CSCL 20/11

The introduction of inertia terms in the theoretical model of thin ring expansion showed that the classical plastic instability concepts, defined in terms of the local strain in the necking region, no longer applied. The introduction of the role of void growth in triggering local necking, through the recently proposed constitutive equation for porous plastic materials allowed this difficulty to be overcome. A criterion based on a critical void volume fraction provided the alternative means to predict failure. This theory was applied to number of configurations (thin ring, thick plate and thick cylinder) under high strain rate loading conditions, and the theoretical results were found to compare favorably with experimental values. GRA

N82-25536# Technion Research and Development Foundation Ltd., Haifa (Israel). Dept. of Mechanical Engineering.

DURABILITY OF STRUCTURAL ADHESIVELY BONDED SYSTEM Annual Report

O. Ishai, S. Gali, and G. Yaniv Jun. 1981 123 p refs

(Contract DAJA37-80-C-0303; DA Proj. 111-61102-BH-57) (AD-A111209; AR-1) Avail: NTIS HC A06/MF A01 CSCL 11/1

A comprehensive literature survey is made and the findings of investigations conducted by the authors during the past few years in this field are summarized. Basic assumptions for the present work are outlined, based on the conclusions of the above survey. An analytical study, supported by empirical data, was conducted on the effects of the state of stress on the adhesive mechanical behavior of a bonded interlaminar layer phase in the non-linear range and the time-dependency of that behavior. Tests were conducted for the derivation of viscoelastic characteristics of the adhesive phase and of the thermoelastic and hygroelastic parameters of the representative adhesives and of CFRP adherends. The effects of temperature and humidity with exposure time on the above characteristics were investigated. The major objective of the experimental work was two-fold: To provide the basic data to serve as inputs for the analysis of the hygrothermomechanical behavior of the bonded system; To develop a methodology for the reduction of the vast experimental work involved in the derivation and evaluation of such data, which are essential for predicting the durability of bonded systems during real service life. Author (GRA)

N82-25537# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.

EFFECT OF SUPPORT CONDITIONS ON BEAM VIBRATIONS SUBJECTED TO MOVING LOADS Final Report

Julian J. Wu Jan. 1982 23 p refs Presented at the 27th Conf. of Army Math., West Point, N.Y., 10-12 Jun. 1981

(DA Proj. 1A1-28312-1A-1A)

(AD-A111937; ARLCB-TR-82002) Avail: NTIS HC A02/MF A01 CSCL 13/13

Solutions of beam vibrations under moving loads are presented with a variety of support conditions. The purpose is to demonstrate how the support conditions will effect such beam motions. The solution method and mathematical background will be reviewed including the introduction of various support parameters. By slightly modifying an existing computational scheme, the desired results have been obtained and presented in several tables and plots showing the effect of support stiffness on beam motions. Author (GRA)

N82-25538# Brown Univ., Providence, R. I. Div. of Engineering.

APPLICATIONS OF BOUND AND MODE APPROXIMATION TECHNIQUES FOR LARGE DEFLECTIONS OF PULSE LOADED STRUCTURES Final Report, 1 Jul. 1978 - 31 Aug. 1981

P. S. Symonds 21 Dec. 1981 10 p refs

(Grant DAAG29-78-G-0085)

(AD-A110803; ARO-15427.3-E) Avail: NTIS HC A02/MF A01 CSCL 11/6

The problem studied in our research has been how to estimate the response of structures of ductile metal to high intensity pressure pulse loading or to impact, in conditions where permanent ('plastic') deformations occur. The aim has been to develop reliable approximate methods of analysis which would be simpler and cheaper than wholly numerical (finite element or finite difference) approaches. The latter are available through a variety of codes, but the desirability of simpler methods to supplement them needs no argument. It is worth re-emphasizing, however, that a main advantage of a sound approximation technique, over a wholly numerical one, is its aid in understanding the basic mechanics of the response, free of unessential detail and irrelevant complications. Author (GRA)

N82-25539# Brown Univ., Providence, R. I.

AN INVESTIGATION OF INHOMOGENEOUS INELASTIC DEFORMATIONS THROUGH PLATE IMPACT RECOVERY EXPERIMENTS AND MATHEMATICAL MODELLING OF PROPAGATING LOCALIZED DEFORMATIONS Final Report, 5 Oct. 1980 - 4 Oct. 1981

R. J. Clifton Jan. 1982 10 p refs

(Contract DAAG29-80-K-0095)

(AD-A110843; ARO-17647.2-E) Avail: NTIS HC A02/MF A01 CSCL 11/6

A high strain rate, pressure-shear experiment has been developed in which a thin specimen attached to an elastic anvil plate is impacted by an elastic flyer plate that is inclined to the direction of approach. This experiment can be used to obtain the plastic response of metals at strain rates of 10 to the 5th power s-1 and pressures of 2-8 GPa. Experimental results for 1100-0 aluminum, 6061-T6 aluminum and OFHC copper show the flow stress at strain rates of 10 to the 5th power s to the -1 power to be much higher than at strain rates of 10 to the 3 power s to the -1 power. For 1100-0 aluminum the effect of hydrostatic pressure on the flow stress has been examined by varying the angle of impact in order to change the ratio of the pressure to the shear stress. No signficant pressure effect has been observed. Author (GRA)

N82-25540# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.

IMPERFECTION SENSITIVITY OF OPTIMIZED STRUCTURES Final Report, Jun. 1976 - Oct. 1980

B. O. Almroth, P. Stern, and D. Bushnell Wright-Patterson, AFB, Ohio AFWAL Mar. 1981 71 p refs

(Contract F33615-76-C-3105; AF Proj. 2307)

(AD-A111681; AFWAL-TR-80-3128) Avail: NTIS HC A04/MF A01 CSCL 12/1

There is a tendency of the critical load to become unstable if the lowest buckling modes are simultaneous or nearly so. This tends to be the case if structural panels are optimized with bifurcation buckling constraints. A complete software package, POIS (Panel Optimization with Integrated Software), was developed to solve this problem. POIS is described in a separate report with a summary presented here. The pre-buckling nonlinear behavior due to geometric imperfections is taken into account. The procedure allows optimization with the collapse load as constraint for panels that buckle locally well below the ultimate load. The computer programs are verified by application in some practical cases involving metal and composite material panels. It is concluded that the most weight - efficient design is one in which local buckling is permitted. A supplementary experimental program should be executed before POIS can be qualified as a reliable instrument for panel design. Author (GRA)

N82-25541# Lockheed Missiles and Space Co., Palo Alto, Calif. Applied Mechanics Lab.

COMPUTERIZED ANALYSIS OF SHELLS: GOVERNING EQUATIONS Final Report, Oct. 1977 - Dec. 1980

David Bushnell Wright-Patterson AFB, Ohio AFWAL Dec. 1981 255 p refs

(Contracts F49620-77-C-0122; F33615-76-C-3105; AF Proj. 2307)

(AD-A111269; AFWAL-TR-81-3048) Avail: NTIS HC A12/MF A01 CSCL 09/2

The volume opens with a general discussion of terms in an energy functional which might be the basis from which equations governing stress, stability, and vibration analyses are derived. The energy expression includes strain energy of the shell and discrete stiffeners, kinetic energy of the shell and stiffeners, constraint conditions with Lagrange multipliers, and other terms arising from the change in direction of applied loads during deformation. Brief discussions are included of the coupling effect between bending and extensional energy needed for the analysis of layered composite shells or elastic-plastic shells, nonlinear terms, and the form that the energy expression takes upon discretization of the structure. A section follows in which the energy formulation for stress, stability, and vibration analyses of an elastic curved beam is given, including thermal effects, moderately large rotations, boundary conditions, and distributed and concentrated loads. The matrix notation and type of discretization are introduced here which will later be used for the analysis of shells of revolution. Terms in the local element stiffness, mass, and load-geometric matrices are derived in terms of nodal point displacements, and it is shown how these local matrices are assembled into global matrices. The purpose of the section is to demonstrate the procedure for derivation of the analogous equations and quantities for shells of revolution or more complex structures. GRA

N82-25542# Dayton Univ., Ohio. Research Inst.

AN EMPIRICAL MODEL FOR LOADING RATIO EFFECT ON FATIGUE CRACK GROWTH RATE DATA Interim Technical Report, May 1980 - Feb. 1981

Russell R. Cervay Wright-Patterson AFB, Ohio AFWAL Nov. 1981 32 p refs

(Contract F33615-80-C-5011; AF Proj. 2421)

(AD-A111265; UDR-TR-81-57; AFWAL-TR-81-4140) Avail: NTIS HC A03/MF A01 CSCL 11/6

Based on a limited amount of 72 F (22 C), positive loading ratio, constant amplitude loading fatigue crack growth test data generated for aluminum alloy 7010-T73651 a mathematical model of the data shift with loading-ratio was formulated. The mathematical model is only applicable to the Paris region of material behavior, and approximates the log-Paris coefficient as a linear relationship of the loading ratio. Using the model a predictive Paris equation was formulated for an unexplored loading ratio prior to the generation of any data at this test-case loading ratio. Following generation of data at the test-case loading ratio and the calculation of the best fit Paris equation to the data set it was found to agree extremely well with the predictive equation formulated beforehand. Author (GRA)

N82-25543# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Structures Lab.

STRENGTH DESIGN OF REINFORCED CONCRETE HYDRAULIC STRUCTURES. REPORT 2: DESIGN AIDS FOR USE IN THE DESIGN AND ANALYSIS OF REINFORCED CONCRETE HYDRAULIC STRUCTURAL MEMBERS SUBJECTED TO COMBINED FLEXURE AND AXIAL LOADS Technical Report, Oct. 1979 - Sep. 1980

Tony C. Liu and Scott Gleason Dec. 1981 229 p refs

(AD-A111648; WES/TR/SL-80-4) Avail: NTIS HC A11/MF A01 CSCL 13/13

This report presents design aids for use in the design and analysis of reinforced concrete hydraulic structural members subjected to combined uniaxial bending and axial loads. A total of 190 load-moment strength interaction diagrams for both single and double reinforced members with various compressive strengths of concrete, yield strengths of steel reinforcement, reinforcement ratios, and concrete covers is included. In addition to design aids, this report includes a commentary explaining how each design aid was calculated, and design examples illustrating the use of the design aids. Author (GRA)

N82-25544# Naval Postgraduate School, Monterey, Calif. Dept. of Mechanical Engineering.

DESIGN AND VALIDATION OF AN APPARATUS FOR HIGH TEMPERATURE FATIGUE TESTING IN AN INERT ENVIRONMENT M.S. Thesis

William Aaron Hastie, Jr. Sep. 1981 58 p refs

(AD-A110990) Avail: NTIS HC A04/MF A01 CSCL 11/6

A synergistic interaction between creep and fatigue in structural materials at high temperature has previously been shown to exist. More recently, the importance of environmental effects on fatigue has been shown to frequently over-shadow the creep-fatigue interaction. As both creep and environmental effects are temperature and time dependent, the role of each is often difficult to separate. The topic of this thesis is the design and validation of an apparatus to study the interactions of environment and creep with fatigue damage at high temperature. The alloy (2 + 1/4) Cr - 1 Mo steel was selected for testing to validate the system as considerable creep-fatigue data exist on this alloy. Strain controlled fully reversed testing was conducted at temperatures of 482 C (900 F) and 538 C (1000 F). The results of the testing at 1% total strain range agreed with published data from the same heat of material. Differences in results at 0.5% total strain range were, however, found to exist. The differences are believed to be due to different specimen geometries used by other studies. This research used uniform gage length instead of the standard hourglass specimens used by others. The uniform gage length samples have a lower fatigue life at the lower strain range than published data. The results from uniform gage length samples are believed to be a better representation of a materials bulk fatigue behavior. Author (GRA)

N82-25545# Lockheed Missiles and Space Co., Palo Alto, Calif. Applied Mechanics Lab.

SUPPLEMENTARY STUDIES ON THE SENSITIVITY OF OPTIMIZED STRUCTURES Final Report, 14 Nov. 1979 - 29 Sep. 1980

Paul S. Jensen and W. A. Loden Wright-Patterson AFB, Ohio AFWAL Mar. 1981 81 p refs

(Contract F336150-76-C-3105; AF Proj. 2307)

(AD-A110994; AFWAL-TR-81-3013) Avail: NTIS HC A05/MF A01 CSCL 13/13

Reports of three related studies germane to structural optimization are provided. The first describes virtual memory simulator suitable for management of large quantities of numerical data such as required for sparse matrix manipulation. The second report describes two sparse matrix processors suitable for the large equation systems arising in structural analysis and provides comparative results. The last report describes a study of two optimization algorithms in the context of structural

optimization. A number of test results for parameter studies and a general comparison of the two algorithms are given. GRA

N82-25546# Japan Atomic Energy Research Inst., Tokyo. Div. of High Temperature Engineering.

CRACK PROPAGATION BEHAVIOR OF GRAPHITE UNDER CYCLIC LOADING CONDITION

Hideo Kakui and Tatsuo Oku Apr. 1980 23 p refs In JAPANESE; ENGLISH summary

(JAERI-M-8808) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A crack propagation test under cyclic loading condition of graphites used in components of high temperature gas cooled reactor is described. The remodelled double cantilever beam specimen of graphite, having a crack range of constant stress intensity factor at the crack edge was used. Three kinds of graphites were used; JA (fine grained, isotropic graphite), FA (fine grained, isotropic graphite) and FB (near isotropic graphite). The three had different coke grain sizes and mechanical properties. Critical stress intensity factor K sub i in the graphites are FA < JA < FB. There is a relationship da/dN = C delta K sup n between stress intensity factor range delta K and crack propagation rate da/dN. Crack propagation rates da/dN for small value of delta K in the graphites are FA > JA > FB. The route of crack propagation appears to depend on coke grain size of the graphite. The effects of mean stress intensity factor range delta K and crack propagation rate da/dN. Crack propagation rates da/dN for small value of delta K in the graphites are FA > JA > FB. The route of crack propagation appears to depend on coke grain size of the graphite. S.L.

N82-25547# Japan Atomic Energy Research Inst., Tokyo. Div. of Reactor Safety.

STUDIES ON FATIGUE CRACK GROWTH AROUND WELDMENT IN SUS304 STAINLESS STEEL. MECHANICAL PROPERTIES AND CRACK GROWTH BEHAVIOR IN BASE METAL, WELD METAL AND HAZ

K. Shibata, Takaichi Kawamura, and Yasuo Kannotoh (Mitsubishi Heavy Industries) Jun. 1980 75 p refs In JAPANESE; ENGLISH summary

(JAERI-M-8900) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

Fatigue crack growth tests concerning the influence of the welding residual stress are described. Tensile test results of the weld plate are also described. In the fatigue tests, center cracked specimens having a tensile residual stress caused by a weldment around the center were used. Tests were made for the base metal, weld metal and heat affected zone. Some conclusions were obtained on the crack growth behavior around the weldment. DOE

N82-25548# Aeronautical Research Inst. of Sweden, Stockholm. Structures Dept.

INTERNATIONAL SYMPOSIUM ON FATIGUE THRESHOLDS Final Report

Anders F. Blom and J. Baecklund Nov. 1981 121 p refs Conf. held at Stockholm, 1-3 Jun. 1981

(Contract STU-80-5049)

(FFA-TN-HU-2274) Avail: NTIS HC A06/MF A01

The proceedings of a conference on fatigue thresholds are reported. The following topics are included: case studies, computation experimental techniques and high temperature applications of fatigue thresholds, environmental conditions, low crack growth rates, micromechanics and mixed mode thresholds, nondestructive testing, nonmetallic materials, short cracks and spectrum loading. Author (ESA)

N82-25549# Research Inst. of National Defence, Stockholm (Sweden).

STEUL: COMPUTER PROGRAM FOR AIR SHOCK WAVE LOADED EULER GIRDERS [STEUL. DATORMODELL FOER LUFTSTOETVAAGSBELASTAD EULERBALK]

Inger Aaseborn and Jan-Erik Jonasson Jan. 1982 59 p refs In SWEDISH

(FOA-C-20440-D4(A3)) Avail: NTIS HC A04/MF A01

The analytic solution for dynamically loaded girders (Bernoulli-Euler theory) is developed and a computer program is presented. Bending moment and shear stress distributions are expressed as time functions. The variable load consists of an overpressure phase followed by an underpressure phase for three typical conditions: simply supported girders, or maximum rigidity at one or at both supports. Author (ESA)

N82-25550# Statens Provningsanstalt, Boraas (Sweden). Div.of Solid Mechanics.

NONLINEAR FRACTURE MECHANICS AND J INTEGRALS. APPLICATION OF PRESENT METHODS TO A SERIES OF LARGE SCALE TEST SPECIMENS

Eva Larsson and Hans Andersson 1980 29 p refs

(SP-RAPP-1981:02) Avail: NTIS HC A03/MF A01

Fracture tests on center cracked commercial steel bars are evaluated, using the J integral and its extended interpretations. For stable crack propagation, the J value calculated from the external energy input is assumed to be independent of stable crack growth and can be described as a function only of load and current crack length. The J values are found by fitting a tensile test curve for the material to a nonlinear material model and by using the parameters obtained to construct a J versus deflection diagram by which the experiments were then evaluated. The procedure is compared with methods where J calibration curves are produced from the load versus deflection curves, defining J as the potential energy change per unit of crack growth. All the methods have weaknesses when applied to real situations and considerable variations in J were obtained.

Author (ESA)

N82-26164# Indian Inst. of Tech., Bombay. Dept. of Aeronautical Engineering.

PENNY SHAPED CRACK AT THE INTERFACE OF TWO BONDED LAYERS OF DISSIMILAR ELASTIC MATERIALS

A. C. Garg *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 17-25 refs (For primary document see N82-26161 16-99)

Avail: NTIS HC A08/MF A01

N82-26167# Indian Inst. of Tech., Kanpur. Dept. of Aeronautical Engineering.

STRONGEST UNIFORM NONHOMOGENEOUS COLUMNS

V. K. Gupta and P. N. Murthy *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 45-49 refs (For primary document see N82-26161 16-99)

Avail: NTIS HC A08/MF A01

N82-26169# Indian Space Research Organization, Trivandrum. Structural Engineering Div.

A FRONTAL SOLUTION FOR EQUILIBRIUM METHOD OF ANALYSIS

S. Yadagiri and K. Prabhakaran *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 55-63 refs (For primary document see N82-26161 16-99)

Avail: NTIS HC A08/MF A01

N82-26176# National Aeronautical Lab., Bangalore (India).

FINITE ELEMENT ANALYSIS OF SOME AEROSPACE SHELL STRUCTURES

S. Viswanath, S. Sridhara Murthy, and C. G. Shah *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 109-115 refs (For primary document see N82-26161 16-99)

Avail: NTIS HC A08/MF A01

N82-26179# P. D. Women's Coll., Jalpaiguri (India). Dept. of Mathematics.

SOME CASES OF BUCKLING OF SANDWICH PLATES

P. Biswas *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 125-127 refs Sponsored in part by the University Grants Commission (For primary document see N82-26161 16-99)

Avail: NTIS HC A08/MF A01

N82-26188# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

FATIGUE CRACK PROPAGATION IN ELASTOPLASTICITY

L. Anquez *In its* La Rech. Aerospatiale, Bi-monthly Bull.

No. 1981-6, Nov.-Dec. 1981 (ESA-TT-741) Mar. 1982 p 27-45 refs Transl. by ONERA into ENGLISH from 'La Rech. Aerospatiale, Bull. Bimestriel (Paris) No. 1981-6, Nov.-Dec. 1981' (For primary document see N82-26185 16-99)
Avail: NTIS HC A04/MF A01; Original report in FRENCH available at ONERA, Paris FF 55

42 GEOSCIENCES (GENERAL)

N82-25551*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MODELING AND SIMULATION FACILITY: RESEARCH REVIEW, 1980 - 1981
Dec. 1981 213 p refs Submitted for publication (NASA-TM-83907; NAS 1.15:83907) Avail: NTIS HC A10/MF A01 CSCL 08F

General circulation modeling studies related to global atmospheric and oceanic research are presented. For individual titles, see N82-25552 through N82-25587.

N82-25552*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE EFFECT OF VARYING AMOUNTS OF SATELLITE DATA, OROGRAPHY AND DIABATIC PROCESSES ON THE NUMERICAL PREDICTION OF AN INTENSE CYCLONE **c47**
R. Atlas *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 7-10 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

Descriptive results from a study of cyclone evolution in the DST-6 forecast case from 0000 GMT 19 February 1976 are presented. The effects of satellite data, orography and diabatic processes on the numerical prediction of cyclone development, and displacement are assessed. Author

N82-25553*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE RELATIVE CONTRIBUTIONS OF INCREASED RESOLUTION IN THE DATA ASSIMILATION AND IN THE FORECAST MODEL TO SATELLITE DATA IMPACT **c47**
R. Atlas, M. Ghil, and M. Halem *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 11-13 ref (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

Assimilation cycles were carried out with two versions of the GLAS second order GCM: a coarse version with 4 deg latitude by 5 deg longitude resolution, called the C model, and a fine version with 2.5 deg latitude by 3 deg longitude resolution called the F model. For the two DST-6 cases where the combined influence of satellite data and model resolution are at a maximum at sea level, the relative contributions of increased resolution in the data assimilation and in the forecast models were evaluated. F model forecasts were generated from the C model SAT assimilation interpolated by the F grid, and C model forecasts were generated from the F model SAT assimilation interpolated to the C grid. These forecasts were then compared with the corresponding forecasts which had utilized the same grid resolution in the data assimilation and forecast models, CS and FS. Author

N82-25554*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE EFFECTS OF TROPICAL WIND DATA ON THE PREDICTION OF ULTRALONG WAVES **c46**
W. E. Baker *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 14-17 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

The influence of tropical wind data on the prediction of planetary waves were studied. Two assimilation experiments were performed, one with and one without FGGE tropical winds. The planetary wave error was then analyzed in 72 h forecasts from the initial conditions provided by the two assimilations. Author

N82-25555*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE STATE OF THE ATMOSPHERE AS INFERRED FROM THE FGGE SATELLITE OBSERVING SYSTEMS DURING SOP-1 **c46**
M. Halem, E. Kalnay, W. E. Baker, and R. Atlas *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 20-36 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

Data assimilation experiments were performed to test the influence of different elements of the satellite observing systems. Results from some of the experiments are presented. These findings show that the FGGE satellite systems are able to infer the three-dimensional motion field and improve the representation of the large-scale state of the atmosphere. Preliminary results of the forecast impact of the FGGE data sets are also presented. Author

N82-25556*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NUMERICAL PREDICTION OF THE LARGE SCALE TROPICAL FLOW **c47**
E. Kalnay, W. E. Baker, and J. Shukla *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 37-45 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

The mean error characteristics of two series of forecasts of the tropical flow were studied. By using as initial conditions analyses made with and without the FGGE special observing system, the impact that initial data has on the accuracy of the forecasts is estimated. Author

N82-25557*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERACTIVE PROCESSING OF SEASAT SCATTEROMETER DATA **c47**
R. Atlas, G. Cole, A. Pursch, and C. Long *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 49-51 (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

The Man-computer Interactive Data Access System (McIDAS), adapted for the interactive processing of satellite-derived temperature soundings and cloud-track winds for the FGGE Special Effort, was adapted for the processing and evaluation of SEASAT data. The implementation of the McIDAS SEASAT processing system required (1) extensive modifications to the data base structure to store and display SASS winds, as well as corroborative level II data, model first guess fields and level III analyses, and (2) the development of software to dealias and analyze SASS wind vectors interactively. Author

N82-25558*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PRELIMINARY EVALUATION OF THE FGGE SPECIAL EFFORT FOR DATA ENHANCEMENT **c47**
R. Atlas, A. Pursch, C. Long, G. Cole, and R. Rosenberg *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 52-60 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

Man-computer Interactive Data Access System (McIDAS) terminals were utilized for data evaluation, quality assessment, and satellite data enhancement. Author

N82-25559*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COMPARISON OF OBSERVED AND COMPUTED BRIGHTNESS TEMPERATURES FOR THE HIRS2 AND MSU SOUNDERS ON TIROS-N **c47**
J. Susskind, J. Rosenfield, and D. Reuter *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 61-67 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

Given the radiosonde temperature and humidity profile, brightness temperatures for the temperature sounding IR channels on HIRS 2 were calculated. The temperature profile was interpolated to 53 levels between 1000 and 30 mb assuming temperature to be linear in the logarithm of the pressure between

the mandatory levels. The 11 levels above 30 mb were extrapolated according to climatology. The surface was taken to be the climatological sea surface temperature. The specific humidity was interpolated between mandatory levels assuming a p(n) dependence. A specific humidity corresponding to a climatological water vapor mixing ratio of 2 ppmv was assumed at and above 100 mb. Zonally averaged climatological ozone profiles were used to compute the ozone component of the transmittance. Author

N82-25560*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOLUTION OF LINEAR SYSTEM OF EQUATIONS WHEN THE MATRIX IS CIRCULANT c64
R. C. Balgovind *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 71-73 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 12A

The general circulant matrix is introduced, and its inversion is shown. Author

N82-25561*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AN ANALYSIS OF INTERMITTENT UPDATING FOR THE SHALLOW WATER EQUATIONS c47
K. P. Bube *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 74-77 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

The method of intermittent updating for a model system is analyzed. How updating one variable of the system affects the other variables, what the factors are which influence the rate of convergence of this procedure, and how measurement error affects the procedure are considered. Author

N82-25562*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APPLICATIONS OF ESTIMATION THEORY TO NUMERICAL WEATHER PREDICTION c47
S. Cohn, M. Ghil, and E. Isaacson *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 refs Prepared in cooperation with New York Univ., N.Y. (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

Numerical weather prediction (NWP) is an initial value problem for a system of nonlinear partial differential equations in which the initial values are known only incompletely and inaccurately. Data at initial time can be supplemented, however, by observations of the system distributed over a time interval preceding it. Estimation theory was successful in approaching such problems for models governed by systems of ordinary differential equations and of linear PDEs. Estimation-theoretic methods for NWP are developed. A model exhibiting many features of large scale atmospheric flow important in NWP is the one governed by the shallow fluid equations. The estimation problem for a linearized formulation of these equations is studied. A finite difference version of the equations is used as a forecast model to simulate the numerical models used in NWP. S.L.

N82-25563*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A STOCHASTIC-DYNAMIC MODEL FOR GLOBAL ATMOSPHERIC MASS-FIELD STATISTICS c46
M. Ghil (New York Univ., N.Y.), R. C. Balgovind (Sigma Data Services Corp.), and E. Kalnay *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 81 (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

Global atmospheric mass field error correlations based on satellite observations and on numerical forecasts show strong and systematic latitude dependence. A model for the latitude dependent spatial correlation structure of mass field forecast errors is derived from dynamical considerations. Three methods of solution were tested. In the first method, the equation was solved by expansion in spherical harmonics, and the correlation function was computed analytically using the expansion coefficients. In the second method, the finite difference equivalent of the equation was solved using a fast poisson solver. The correlation function was computed using stratified sampling of the individual realizations. In the third method, a higher order equation was derived, and solved directly in finite differences by two successive applications of the fast poisson solver. The three methods were compared for accuracy and efficiency, and the third method was chosen as clearly superior. S.L.

N82-25564*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A VARIABLE VERTICAL RESOLUTION WEATHER MODEL WITH AN EXPLICITLY RESOLVED PLANETARY BOUNDARY LAYER c47
H. M. Helfand *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 82-83 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

A version of the fourth order weather model incorporating surface wind stress data from SEASAT A scatterometer observations is presented. The Monin-Obukhov similarity theory is used to relate winds at the top of the surface layer to surface wind stress. A reasonable approximation of surface fluxes of heat, moisture, and momentum are obtainable using this method. A Richardson number adjustment scheme based on the ideas of Chang is used to allow for turbulence effects. J.D.

N82-25565*# National Academy of Sciences - National Research Council, Washington, D. C.
A FOUR DIMENSIONAL VARIATIONAL ANALYSIS EXPERIMENT c46
R. Hoffman *In* NASA. Goddard Space Flight Center Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 84-86 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

A demonstration that the four dimensional variational analysis method using the governing equations as exact constraints can be successfully employed for a perfect model and for a simple, but nonlinear, system is presented. The method is stable in an assimilation cycle. The method reconstructs the unobservable variables; in the case demonstrated, no velocity data was observed. The analysis errors are much smaller than the observing system errors. J.D.

N82-25566*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A SIMPLE ATMOSPHERIC MODEL ON THE SPHERE WITH 100% PARALLELISM c46
E. Kalnay and L. L. Takacs *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 89-95 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

A simple shallow water equations model used to test numerical weather prediction schemes is presented. The spherical geometry is transformed into a formally doubly periodic configuration which can be implemented on a massively parallel computer at 100% parallelism. A nonstaggered grid with all variables defined at the grid points (circles) is used. The parallel structure was simulated by performing step 1 in a FORTRAN array, on an Amdahl serial machine, changing the signs of the winds on the dark side. J.D.

N82-25567*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON THE EFFECT OF HIGH LATITUDE FILTERING IN GLOBAL GRID POINT MODELS c46
L. L. Takacs, R. C. Balgovind, M. Iredell, and E. Kalnay *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 96-104 refs Prepared in cooperation with Sigma Data Services Corp. (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

The application of various Fourier filtering techniques in a coarse resolution grid point model and the poor simulation of the nonlinear effects responsible for change in the mean zonal flow is discussed. The poor simulation results in spurious energy and momentum transfers. An operational filter, a second order filter on a staggered grid, a fourth order filter on a nonstaggered grid, and a biharmonic diffusion filter were considered. J.D.

N82-25568*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SHALLOW WATER EXPERIMENTS USING AN IMPROVED KREISS-OLIGER 2-4 SCHEME **c47**
L. L. Takacs and R. C. Balgovind *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 105-113 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

The Abarbanel-Gottleib (AG) modification of the Kreiss-Oliger (KO) scheme is applied to a global 1-level shallow water model and the results compared to results obtained using the standard KO scheme. The standard KO scheme consists of the second order leapfrog scheme for time derivatives and fourth order space differencing for spatial derivatives. The AG scheme modifies the KO scheme in a manner similar to that done by Wilson to the multidimensional leapfrog scheme, obtaining a 35-40% improvement of the maximum time step. Application of the AG scheme expands the domain of influence of the KO scheme by including off-axis grid points. J.D.

N82-25569*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A MODEL TO DETERMINE OPEN OR CLOSED CELLULAR CONVECTION **c46**
H. M. Helfand and E. Kalnay *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 117-118 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

A simple mechanism is proposed to explain the observed presence in the atmosphere of open or closed cellular convection. If convection is produced by cooling concentrated near the top of the cloud layer, as in radiative cooling of stratus clouds, it develops strong descending currents which are compensated by weak ascent over most of the horizontal area, and closed cells result. Conversely, heating concentrated near the bottom of a layer, as when an air mass is heated by warm water, results in strong ascending currents compensated by weak descent over most of the area, or open cells. This mechanism is similar to the one suggested by Stommel (1962) to explain the smallness of the oceans' sinking regions. The mechanism is studied numerically by means of a two-dimensional, nonlinear Boussinesq model. J.D.

N82-25570*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LARGE AMPLITUDE STATIONARY ROSSBY WAVES IN THE SOUTHERN HEMISPHERE **c46**
E. Kalnay and M. Halem *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 119-130 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

Observational evidence of the characteristics of the large amplitude, short wavelength stationary waves found in the lee of South America and Australia during the complete first special observing period of the first GARP global experiment is presented. The structure and evolution of the waves are described and their possible origin discussed. J.D.

N82-25571*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE ROLE OF ZONALLY ASYMMETRIC HEATING IN THE VERTICAL AND TEMPORAL STRUCTURE OF THE GLOBAL SCALE FLOW FIELDS DURING FGGE SOP-1 **c46**
J. Paegle (Utah Univ.), E. Kalnay, and W. E. Baker *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 132-141 refs Presented at Intern. Conf. on Early Results of FGGE and Large-Scale Aspects of Monsoon Exptn., Tallahassee, Fla., 12-17 Jan. 1981 Submitted for publication (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

The global scale structure of atmospheric flow is best documented on time scales longer than a few days. Theoretical and observational studies of ultralong waves have emphasized forcing due to global scale variations of topography and surface heat flux, possibly interacting with baroclinically unstable or vertically refracting basic flows. Analyses of SOP-1 data in terms of global scale spherical harmonics is documented with emphasis upon weekly transitions. S.L.

N82-25572*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTEGRATED AND SPECTRAL ENERGY FLOWS OF THE GLAS GCM **c46**
J. Tennebaum *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 142-144 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

Methods to analyze the generation, transport, and dissipation of energy to study geophysical fluid flows are discussed. Energetics analyses are pursued in several directions: (1) the longitudinal and time dependence on the energy flow to the stratosphere was examined as a function of geographical sector; (2) strong and weak energy flows were correlated by medium range forecasts; (3) the one dimensional spectral results (Fourier services around latitude circles) were extended to spherical harmonics over a global domain; (4) the validity of vertical velocities derived from mass convergence was examined for their effect on the conversion of eddy available potential energy to eddy kinetic energy. E.A.K.

N82-25573*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A NUMERICAL MODEL STUDY OF LONG-TERM PLANETARY WAVE PREDICTABILITY **c46**
R. L. Wobus *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 145-146 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

A numerical model was developed to study planetary wave behavior over periods up to 4 months under the influences of stochastic and diffusive forcing by synoptic scale motions and of sea surface temperature anomalies. The model is suitable for Monte Carlo experiments which provide ensemble mean and variance predictions and permit the response to heating anomalies to be partly separated from random variability. The model incorporates the linear-balanced dynamical equations for wind at two tropospheric levels and temperature at one level. The model atmosphere is forced by semiempirical January heating linearly dependent on local air temperature. Topography and the lower boundary layer are represented by vertical motion and drag functions, respectively, of the lower level wind. The linear phase speeds of Rossby waves are modified to reflect the effect of the stratosphere. E.A.K.

N82-25574*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CLIMATE MODEL POSTPROCESSING **c47**
J. Abeles, E. Pittarelli, and D. A. Randall *In its* Modeling Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 149-152 (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

The development of new postprocessing software of the climate modeling group is summarized. Code, test, and perform simulations with global general circulation models are described. The models improve understanding and ability to predict the vagaries of weather and climate. To learn from and utilize the model results, it is necessary to create elaborate postprocessing software to allow analysis of the large volume of data produced. The models produce sigma history tapes. The sigma history records are interpolated to pressure history records, which are written on a pressure history tape. The model results are analyzed on pressure surfaces, with snap shots or time averages. E.A.K.

N82-25575*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SEASONAL CYCLE OF HEIGHTS, TEMPERATURES AND SEA LEVEL PRESSURE OVER THE NORTHERN HEMISPHERE **c46**
B. Doty and K. C. Mo *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 153-157 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

The annual and semiannual cycles of sea level pressure and surface temperature over the Northern Hemisphere are documented. The annual cycles in the geopotential height fields for several levels are also examined. It was found that the continental winter maxima in the sea level pressure field extended upward to near

the 700 mb level. At 500 mb and above, however, they found that the annual cycle exhibits summertime maxima over both sea and land. E.A.K.

N82-25576*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANALYSIS OF THE SURFACE HEAT BALANCE OVER THE WORLD OCEAN **c46**
S. K. Esbenson *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 158-162 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

The net surface heat fluxes over the global ocean for all calendar months were evaluated. To obtain a formula in the form Qs = Q2(T*A - Ts), where Qs is the net surface heat flux, Ts is the sea surface temperature, T*A is the apparent atmospheric equilibrium temperature, and Q2 is the proportionality constant. Here T*A and Q2, derived from the original heat flux formulas, are functions of the surface meteorological parameters (e.g., surface wind speed, air temperature, dew point, etc.) and the surface radiation parameters. This formulation of the net surface heat flux together with climatological atmospheric parameters provides a realistic and computationally efficient upper boundary condition for oceanic climate modeling. E.A.K.

N82-25577*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPATIAL AND TEMPORAL SCALES OF TIME-AVERAGED 700 MB HEIGHT ANOMALIES **c47**
D. Gutzler *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 163-169 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

The monthly and seasonal forecasting technique is based to a large extent on the extrapolation of trends in the positions of the centers of time averaged geopotential height anomalies. The complete forecasted height pattern is subsequently drawn around the forecasted anomaly centers. The efficacy of this technique was tested and time series of observed monthly mean and 5 day mean 700 mb geopotential heights were examined. Autocorrelation statistics are generated to document the tendency for persistence of anomalies. These statistics are compared to a red noise hypothesis to check for evidence of possible preferred time scales of persistence. Space-time spectral analyses at middle latitudes are checked for evidence of periodicities which could be associated with predictable month-to-month trends. A local measure of the average spatial scale of anomalies is devised for guidance in the completion of the anomaly pattern around the forecasted centers. E.A.K.

N82-25578*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MID-LATITUDE WIND FORCED OCEAN CIRCULATION STUDIES **c48**
D. E. Harrison *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 170-175 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 08J

A simple barotropic vorticity equation model was developed to study some of the various modeling factors that affect the characteristics of strong western boundary currents like the Gulf Stream and Kuroshio. Successful prediction of sea surface temperature, both in the climatological mean and over periods as short as 1 month requires that the heating tendency, due to horizontal advection of heat by these currents, be accurately modeled. Conventional, coarse resolution ocean models do not satisfactorily reproduce the dominant features of these currents. It is concluded that it is important to understand why they do not and what must be done to do so in the future. E.A.K.

N82-25579*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SEASONAL-CYCLE CLIMATE MODEL **c47**
L. Marx and D. A. Randall *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 185-187 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

The seasonal cycle run which will become the control run for the comparison with runs utilizing codes and parameterizations developed by outside investigators is discussed. The climate model currently exists in two parallel versions: one running on the Amdahl and the other running on the CYBER 203. These two versions are as nearly identical as machine capability and the requirement for high speed performance will allow. Developmental changes are made on the Amdahl/CMS version for ease of testing and rapidity of turnaround. The changes are subsequently incorporated into the CYBER 203 version using vectorization techniques where speed improvement can be realized. The 400 day seasonal cycle run serves as a control run for both medium and long range climate forecasts alsensitivity studies. E.A.K.

N82-25580*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
QUASI-LANGRANGIAN MODELS OF NASCENT THERMALS **c46**
S. Rambaldi and D. A. Randall *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 188-192 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

The motions in and around an isolated thermal were studied and rising motion in the core, and sinking motion on the outside were found; while the circulation resembled that of a vortex ring. In an entity cloud model, cloudy thermal is tracked, in a Lagrangian fashion, as a discrete entity; the field of motion in and around the thermal is not explicitly simulated. Field of motion cloud models, in which the equations of motion are numerically integrated on an Eulerian grid were developed. It is shown that the great potential of a hybrid cloud model can combine the simplicity of the entity models with the generality and flexibility of the field-of-motion models. A key problem to be overcome in the development of a hybrid model is the formulation of a mathematical framework within which the cloud dynamics can be represented. E.A.K.

N82-25581*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOME ASPECTS OF SOUTHWEST MONSOON AS SEEN IN A GLAS GCM SIMULATION **c47**
V. Satyan *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 195-197 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

The GCM simulations to see if they simulate the southwest summer monsoon or aspects of it were studied. In particular, the GLAS GCM simulations have also been studied with monsoon in view. Aspects of the summer monsoon, viz., disturbances in the monsoon flow and periodicities in the monsoon fluctuations as revealed in a simulation were investigated. Results of climate simulation for 50 summer days from June 15, 1979 through August 3, 1979 are reported. Daily mean fields were computed from these data sets for the monsoon region. The monsoon region here is defined as the region bounded by latitudes 30 S - 42 N and longitudes 45 E - 120 E. E.A.K.

N82-25582*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AN ANALYSIS OF THE CLOUD FIELDS SIMULATED BY THE GLAS CLIMATE MODEL **c47**
C.-H. Moeng and D. A. Randall *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 205-206A refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

The cloud field produced by the climate model was analyzed. The following items are discussed: (1) reasonable cloudiness production by the model; (2) comparison of the amount of model generated cumulus cloudiness to super saturation cloudiness; and (3) the size and effect of cumulus clouds on radiation balance. It is shown that the scattered, small scale cumulus clouds occur more frequently than the horizontally wide spread supersaturation clouds in the low latitudes and mid troposphere. E.A.K.

N82-25583*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CLIMATOLOGY OF BLOCKING IN THE GLAS CLIMATE MODEL **c47**
J. Shukla, K. C. Mo, and M. Eaton *In its* Modeling and Simulation

Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 207-216 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

The GLAS model's ability to simulate the occurrence of persistent anomalies to be referred to as blocking was examined. The GLAS climate model was integrated with a variety of initial and boundary conditions. Results of winter and summer simulation by the GLAS climate model are discussed. The model shows success in simulating the storm tracks. E.A.K.

N82-25584*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STRUCTURE AND DYNAMICS OF MONSOON DEPRESSIONS: THE MONEX DEPRESSION (JULY 1979) c47
J. Shukla *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 217-222 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

The mechanisms for the formation and movement of monsoon depressions are discussed. The east-west oriented monsoon throughs which move north and south and appear over the Bay of Bengal and move northwest over India are examined. The mechanisms of formation and movement are summarized: (1) monsoon depressions over the Bay of Bengal are caused either by amplification of westward propagating weak disturbances or by downward propagation of the internal jet instability of the easterly jet; (2) the barotropic instability of the low level flow over the Bay of Bengal is conductive to the growth of weak disturbances; (3) the CISK is the primary driving mechanism for the rapid growth for a preexisting weak perturbation; and (4) once the disturbance has attained adequate amplitude in the lower levels, the low level moisture convergence and latent heat condensation is utilized more efficiently for the development of a vertically coupled deep disturbance which along with upper level easterlies contribute to the westward propagation of the disturbance. E.A.K.

N82-25585*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NUMERICAL PREDICTION OF THE MONSOON DEPRESSION OF 5-7 JULY, 1979 c47
J. Shukla, R. Atlas, and W. E. Baker *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 223-230 refs Submitted for publication (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

The objective analysis and assimilation procedure with the FGGE/MONEX data are described. Numerical predictions with the GLAS general circulation model were made from the two initial conditions arrived at by assimilating the two different data sets. The model, the analysis and assimilation procedure, the differences in the analyses due to different data inputs, and the differences in the numerical prediction of monsoon depressions are outlined. E.A.K.

N82-25586*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GLOBAL AND LOCAL FLUCTUATIONS OF WINTER AND SUMMER SIMULATIONS WITH THE GLAS CLIMATE MODEL c47
D. M. Straus and J. Shukla *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 231-236 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

Winter and summer simulations were carried out with an improved version of the GLAS general circulation model. An improved method of computing the boundary layer fluxes, and a more realistic specification of the albedo of snow and ice covered surfaces were used. Each particular diagnostic quantity was computed from the model data and each of the 15 years of observations in precisely the same way, wherever possible. The reported observational results are averaged over the 15 winters or summers, as appropriate. Author

N82-25587*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INFLUENCE OF SURFACE-ALBEDO IN SUBTROPICAL REGIONS ON JULY CIRCULATION c46
Y. Sud and M. Fennessy *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 237-240 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

A simulation study to examine the influence of surface-albedo on July circulation in subtropical regions is presented. The results are based on two 47-day integrations. In the first integration, called the control run, surface albedos were normally prescribed, whereas in the second integration, called the anomaly run, the surface albedo was modified in four regions: the Sahel in Africa, the Great Plains in the United States, the Thar Desert border in the Indian subcontinent, and Brazil in South America. Each run was started from observed initial conditions for June 15, 1979 based on NMC analysis. The surface albedo in each of the regions was arbitrarily made 30%. Author

N82-25588*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
ANALYZE SATELLITE-TRACKING LASER DATA IN ORDER TO STUDY SATELLITE EPHEMERIDES, SOLID-EARTH AND OCEAN TIDES AND LASER SYSTEM PERFORMANCE Final Report, 3 Jan. - 31 Dec. 1980
E. M. Gaposchkin Aug. 1981 339 p
(Contract NAS5-25998)
(NASA-CR-166809; NAS 1.26:166809) Avail: NTIS HC A15/MF A01 CSCL 05B

The decrease in the semimajor axis of Lageos is considerably larger than expected. Gravitational effects, reference system effects, solar radiation pressure, Earth albedo pressure, neutral atmospheric drag, the Poynting Robertson Effect, and electrodynamic effects were used in explaining the observations. Quick look data provided are used to determine the Earth's polar motion and length of day. This process is routine, and provides these geophysical data every five days. S.L.

N82-25589*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A SURVEY OF THE THEORY OF THE EARTH'S ROTATION
W. H. Cannon 1 Nov. 1981 87 p refs
(Contract NAS7-100)
(NASA-CR-168989; JPL-PUB-82-38; NAS 1.26:168989) Avail: NTIS HC A05/MF A01 CSCL 08E

The theory of the Earth's rotation and the geophysical phenomena affecting it is examined. First principles are reviewed and the problem of polar motion and UT1 variations is formulated in considerable generality and detail. The effects of Earth deformations and the solid Earth tides are analyzed. A.R.H.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N82-25590*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
GEOLOGIC APPLICATION OF THERMAL INERTIA IMAGING USING HCMM DATA Final Report
Anne B. Kahle, John P. Schieldge, Michael J. Abrams, Ronald E. Alley, and Catherine J. LeVine, Principal Investigators 15 Sep. 1981 213 p refs Original contains color imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code), Greenbelt, Md. 20771. Domestic users send orders to 'Attn.: World Data Center A for Rockets and Satellites'. HCMM
(Contract NAS7-100)
(E82-10132; NASA-CR-168516; JPL-Pub-81-55; NAS 1.26:168516) Avail: NTIS HC A10/MF A01 CSCL 08G

Three test sites in the western US were selected to discriminate among surface geologic materials on the basis of their thermal properties as determined from HCMM data. Attempts to determine quantitatively accurate thermal inertia values from HCMM digital data met with only partial success due to the effects of sensor miscalibrations, radiative transfer in the

atmosphere, and varying meteorology and elevation across a scene. In most instances, apparent thermal inertia was found to be an excellent qualitative representation of true thermal inertia. Computer processing of digital day and night HCMM data allowed construction of geologically useful images. At some test sites, more information was provided by data than LANDSAT data. Soil moisture effects and differences in spectrally dark materials were more effectively displayed using the thermal data. Author

N82-25591*# Energy, Mines and Resources Canada, Ottawa (Ontario). Geomagnetic Service.
THE REDUCTION, VERIFICATION AND INTERPRETATION OF MAGSAT MAGNETIC DATA OVER CANADA Progress Report
R. L. Coles, Principal Investigator, E. Dawson, G. V. Haines, G. Jansen vanBeek, J. K. Walker, and L. R. Newitt Dec 1981 10 p Sponsored by NASA ERTS
(E82-10301; NASA-CR-168876; NAS 1.26:168876; PR-4) Avail: NTIS HC A02/MF A01 CSCL 05B

Analysis of Investigator B tapes was extended to use a statistical screening of individual data points in each grid cell over the map area. The mean value of data from each cell was computed and all data values more than 4nT from the mean were rejected. The revised mean and standard deviation was computed. The average standard deviation for all map grid cells was 1.4nT for the scalar anomaly map and about 2nT for the vector component anomaly maps. At this stage, the grid cell is larger and spatial resolution lower for the vector maps than for the scalar maps, because the vector components are considerably more disturbed and more data points were rejected. An approach for altitude adjustment is in progress so that corrections can be made and data reduction procede. To evaluate the use of scalar and vector MAGSAT data for the production of regional magnetic charts, charts of the north, east, vertical, and scalar field derived from MAGSAT and from Canadian aeromagnetic data were compared. It appears possible to retrieve crustal signals from the horizontal vector components despite external disturbance fields at high latitude. A.R.H.

N82-25592*# Energy, Mines and Resources Canada, Ottawa (Ontario). Geomagnetic Service.
THE REDUCTION, VERIFICATION AND INTERPRETATION OF MAGSAT MAGNETIC DATA OVER CANADA Progress Report
R. L. Coles, Principal Investigator, G. V. Haines, G. Jansen vanBeek, J. K. Walker, L. R. Newitt, and A. Nandi Apr. 1982 3 p ERTS
(E82-10302; NASA-CR-168877; NAS 1.26:168877; PR-5) Avail: NTIS HC A02/MF A01 CSCL 05B

Correlations between the MAGSAT scalar anomaly map produced at the Earth Physics ranch and other geophysical and geological data reveal relationships between high magnetic field and some metamorphic grade shields, as well as between low magnetic field and shield regions of lower metamorphic grade. An intriguing contrast exists between the broad low anomaly field over the Nasen-Gakkel Ridge (a spreading plate margin) and the high anomaly field over Iceland (part of a spreading margin). Both regions have high heat flow, and presumably thin magnetic crust. This indicates that Iceland is quite anomalous in its magnetic character, and possible similarities with the Alpha Ridge are suggested. Interesting correlations exist between MAGSAT anomalies around the North Atlantic, after reconstructing the fit of continents into a prerifting configuration. These correlations suggest that several orogenies in that region have not completely destroyed an ancient magnetization formed in high grade Precambrian rocks. A.R.H.

N82-25593*# Miami Univ., Fla. School of Marine and Atmospheric Science.
INVESTIGATIONS OF MEDIUM WAVELENGTH MAGNETIC ANOMALIES IN THE EASTERN PACIFIC USING MAGSAT DATA Interim Report, 1 Jan. - 31 Mar. 1982
Christopher G. A. Harrison, Principal Investigator May 1982 16 p Sponsored by NASA ERTS
(E82-10331: NASA-CR-168936) Avail: NTIS HC A02/MF A01 CSCL 08N

A paper which discusses a problem in representing the core magnetic field of the Earth using spherical harmonics was revised and accepted for publications. Page proofs of a second paper concerning off center dipole modelling of the Earth's magnetic field are presented. A.R.H.

N82-25594*# Michigan State Univ., East Lansing. Center for Remote Sensing.
USE OF REMOTE SENSING FOR LAND USE POLICY FORMULATION Annual Progress Report, 1 Jun. 1980 - 31 May 1981
31 May 1981 90 p ERTS
(Grant NGL-23-004-083)
(E82-10332; NASA-CR-168951; NAS 1.26:168951) Avail: NTIS HC A05/MF A01 CSCL 05B

Progress in studies for using remotely sensed data for assessing crop stress and in crop estimation is reported. The estimation of acreage of small forested areas in the southern lower peninsula of Michigan using LANDSAT data is evaluated. Damage to small grains caused by the cereal leaf beetle was assessed through remote sensing. The remote detection of X-disease of peach and cherry trees and of fire blight of pear and apple trees was investigated. The reliability of improving on standard methods of crop production estimation was demonstrated. Areas of virus infestation in vineyards and blueberry fields in western and southwestern Michigan were identified. The installation and systems integration of a microcomputer system for processing and making available remotely sensed data are described. J.D.

N82-25595*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
GROUND TRUTH CROP PROPORTION SUMMARIES FOR US SEGMENTS, 1976-1979
Robert Horvath, Principal Investigator, Daniel Rice, and Thomas Wessling Oct. 1981 101 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15476; Proj. AgRISTARs)
(E82-10333; NASA-CR-167603; SR-E1-04189; NAS 1.26:167603; ERIM-152400-13-T) Avail: NTIS HC A06/MF A01 CSCL 02C

The original ground truth data was collected, digitized, and registered to LANDSAT data for use in the LACIE and AgRISTARS projects. The numerous ground truth categories were consolidated into fewer classes of crops or crop conditions and counted occurrences of these classes for each segment. Tables are presented in which the individual entries are the percentage of total segment area assigned to a given class. The ground truth summaries were prepared from a 20% sample of the scene. An analysis indicates that this size of sample provides sufficient accuracy for use of the data in initial segment screening. T.M.

N82-25596*# Stanford Univ., Calif. Dept. of Geology.
HCMM: SOIL MOISTURE IN RELATION TO GEOLOGIC STRUCTURE AND LITHOLOGY, NORTHERN CALIFORNIA Final Report
Ernest I. Rich, Principal Investigator Mar. 1981 22 p Original contains imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to 'Attn: National Space Science Data Center'; non-domestic users send orders to 'Attn: World Data Center A for Rockets and Satellites'. HCMM
(Contract NAS5-24479)
(E82-10334; NASA-CR-168953; NAS 1.26:168953) Avail: NTIS HC A02/MF A01 CSCL 08M

Some HCMM images of about 80,000 sq km in northern California were qualitatively evaluated for usefulness in regional geologic investigations of structure and lithology. The thermal characteristics recorded vary among the several geomorphic provinces and depends chiefly on the topographic expression and vegetation cover. Identification of rock types, or groups of rock types, was most successfully carried out within the semi-arid parts of the region; however, extensive features, such as faults, folds and volcanic fields could be delineated. Comparisons of seasonally obtained HCMM images were limited value, except in semi-arid regions. Author

N82-25597*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGSAT DATA PROCESSING: A REPORT FOR INVESTIGATORS
R. A. Langel, J. Berbert, T. Jennings, and R. Horner, Principal Investigators Nov. 1981 315 p refs ERTS
(E82-10335; NASA-TM-82160; NAS 1.15:82160) Avail: NTIS HC A14/MF A01 CSCL 05B

The in-flight attitude and vector magnetometer data bias recovery techniques and results are described. The attitude bias recoveries are based on comparisons with a magnetic field model and are thought to be accurate to 20 arcsec. The vector magnetometer bias recoveries are based on comparisons with the scalar magnetometer data and are thought to be accurate to 3 nT or better. The MAGSAT position accuracy goals of 60 m radially and 300 m horizontally were achieved for all but the last 3 weeks of MAGSAT lifetime. This claim is supported by ephemeris overlap statistics and by comparisons with ephemerides computed with an independent orbit program using data from an independent tracking network. MAGSAT time determination accuracy is estimated at 1 ms. Several errors in prelaunch assumptions regarding data time tags, which escaped detection in prelaunch data tests, and were discovered and corrected postlaunch are described. Data formats and products, especially the Investigator-B tapes, which contain auxiliary parameters in addition to the basic magnetometer and ephemeris data, are described. T.M.

N82-25598*# Bureau de Recherches Geologiques et Minieres, Orleans (France). Dept. Carte Geologique et Geologie Generale.
SPATIAL THERMAL RADIOMETRY CONTRIBUTION TO THE MASSIF ARMORICAIN AND THE MASSIF CENTRAL (FRANCE) LITHO-STRUCTURAL STUDY Final Report
Jean-Yves Scanvic, Principal Investigator Nov. 1980 85 p refs Sponsored by NASA Original contains imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to "Attn: National space Science Data Center"; non-domestic users send orders to "Attn: World Data Center A for Rockets and Satellites". HCMM
(E82-10336; NASA-CR-168955; NAS 1.26:168955; BRGM-80-SGN-848-Geo; Rept-3) Avail: NTIS HC A05/MF A01 CSCL 08G

Thermal zones delimited on HCMM images, by visual interpretation only, were correlated with geological units and carbonated rocks, granitic, and volcanic rocks were individualized. Rock signature is an evolutive parameter and some distinctions were made by addition of day, night and seasonal thermal image interpretation. This analysis also demonstrated that forest cover does not mask the underlying rocks thermal signature. Thermal anomalies were discovered. Geological targets were defined in the Paris Basin and the Montmarault granite. A.R.H.

N32-25599*# Washington Univ., St. Louis, Mo. Dept. of Earth and Planetary Sciences.
IMAGE PROCESSING APPLIED TO GRAVITY AND TOPOGRAPHY DATA COVERING THE CONTINENTAL UNITED STATES
R. E. Arvidson, E. A. Guinness, J. W. Strebeck, G. F. Davies, and K. J. Schulz, Principal Investigators 15 Mar. 1982 26 p refs Submitted for publication Sponsored by NASA ERTS
(E82-10337; NASA-CR-168956; NAS 1.26:168956) Avail: NTIS HC A03/MF A01 CSCL 08G

The applicability of fairly standard image processing techniques to processing and analyzing large geologic data sets in addressed. Image filtering techniques were used to interpolate between gravity station locations to produce a regularly spaced data array that preserves detail in areas with good coverage, and that produces a continuous tone image rather than a contour map. Standard image processing techniques were used to digitally register and overlay toporaphic and gravity data, and the data were displayed in ways that emphasize subtle but pervasive structural features. The potential of the methods is illustrated through a discussion of linear structures that appear in the processed data between the midcontinent gravity high and the Appalachians. M.G.

N82-25600*# Research Triangle Inst., Research Triangle Park, N. C.
A PRELIMINARY STUDY OF THE APPLICATION OF HCMM SATELLITE DATA TO DEFINE INITIAL AND BOUNDARY CONDITIONS FOR NUMERICAL MODELS: A CASE STUDY IN ST. LOUIS, MISSOURI Final Report
Fred M. Vukovich, Principal Investigator May 1982 118 p refs HCMM
(Contract NAS5-26442)
(E82-10338; NASA-CR-168957; NAS 1.26:168957; RTI-4182-2155-F) Avail: NTIS HC A05/MF A01 CSCL 08M

Infrared and visible HCMM data were used to examine the potential application of these data to define initial and boundary conditions for mesoscale numerical models. Various boundary layer models were used to calculate the distribution of the surface heat flux, specific humidity depression (the difference between the specific humidity in the air at approxmately the 10 m level and the specific humidity at the ground), and the eddy vicosity in a 72 km by 72 km area centered about St. Louis, Missouri. Various aspects of the implications of the results on the meteorology of St. Louis are discussed. Overall, the results indicated that a reasonable estimate of the surface heat flux, urban albedo, ground temperature, and specific humidity depression can be obtained using HCMM satellite data. Values of the ground-specific humidity can be obtained if the distribution of the air-specific humidity is available. More research is required in estimating the absolute magnitude of the specific humidity depression because calculations may be sensitive to model parameters. Author

N82-25601*# Purdue Univ., Lafayette, Ind. Dept. of Geosciences.
[AEROMAGNETIC AND SATELLITE MAGNETIC ANOMALLY MAPPING] Quarterly Progress Report, Jan. - Mar. 1982
L. W Braile, W. J. Hinze, and R. R. B. vonFrese, Principal Investigators 31 Mar. 1982 8 p Sponsored by NASA ERTS
(E82-10339; NASA-CR-168958; NAS 1.26:168958) Avail: NTIS HC A02/MF A01 CSCL 05B

Efforts to process 2 deg-averaged MAGSAT data for a radially polarized map of Africa and western Europe and investigator B data tapes were initiated M.G.

N82-25602*# General Software Corp., Landover, Md.
LANDSAT-D CONICAL SCANNER EVALUATION PLAN
Stephen Bilanow and Lily C. Chen, Principal Investigators Mar. 1982 102 p refs ERTS
(Contract NAS5-26205)
(E82-10340; NASA-CR-166790; NAS 1.26:166790; GSC-TR8203) Avail: NTIS HC A06/MF A01 CSCL 14B

The planned activities involved in the inflight sensor calibration and performance evaluation are discussed and the supporting software requirements are specified. The possible sensor error sources and their effects on sensor measurements are summarized. The methods by which the inflight sensor performance will be analyzed and the sensor modeling parameters will be calibrated are presented. In addition, a brief discussion on the data requirement for the study is provided. T.M.

N82-25603*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE INFLUENCE OF AUTOCORRELATION IN SIGNATURE EXTRACTION: AN EXAMPLE FROM A GEOBOTANICAL INVESTIGATION OF COTTER BASIN, MONTANA
M. L. Labovitz and E. J. Masuoka, Principal Investigators Dec. 1981 28 p refs Submitted for publication ERTS
(E82-10341; NASA-TM-83871; NAS 1.15:83871) Avail: NTIS HC A03/MF A01 CSCL 05B

The presence of positive serial correlation (autocorrelation) in remotely sensed data results in an underestimate of the variance-covariance matrix when calculated using contiguous pixels. This underestimate produces an inflation in F statistics. For a set of Thematic Mapper Simulator data (TMS), used to test the ability to discriminate a known geobotanical anomaly from its background, the inflation in F statistics related to serial correlation is between 7 and 70 times. This means that significance tests of means of the spectral bands initially appear to suggest that the anomalous site is very different in spectral reflectance

and emittance from its background sites. However, this difference often disappears and is always dramatically reduced when compared to frequency distributions of test statistics produced by the comparison of simulated training sets possessing equal means, but which are composed of autocorrelated observations. Author

N82-25604*# Colorado Univ., Boulder. Dept. of Astrogeophysics.

INVESTIGATION OF GEOMAGNETIC FIELD FORECASTING AND FLUID DYNAMICS OF THE CORE Quarterly Status Technical Progress Report, 1 Oct. - 31 Dec. 1981

Edward R. Benton, Principal Investigator 1 Jan. 1982 3 p ERTS

(Contract NAS5-25957)

(E82-10342; NASA-CR-168959; NAS 1.26:168959; QSTPR-8) Avail: NTIS HC A02/MF A01 CSCL 08G

Accomplishments to date were summarized in three parts submitted for publication. Goddard models and MAGSAT data were used heavily in the investigation which address: (1) the sensitivity of selected geomagnetic properties to truncation level of spherical harmonic expansions; (2) the pole strength of the Earth from MAGSAT, and magnetic determination of the core radius; and (3) frozen flux upper limits to the MAGSAT geomagnetic coefficients and relative multipole indices for Earth. A.R.H.

N82-25605*# Texas A&M Univ., College Station. Remote Sensing Center.

ORBITING PASSIVE MICROWAVE SENSOR SIMULATION APPLIED TO SOIL MOISTURE ESTIMATION Final Report

R. W. Newton, Principal Investigator, B. V. Clark, W. M. Pitchford, and J. F. Paris (Houston Univ., Clear Lake City) Dec. 1979 219 p Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS

(Grant NsG-5266)

(E82-10343; NASA-CR-168960; NAS 1.26:168960; RSC-3753) Avail: NTIS HC A10/MF A01 CSCL 08M

A sensor/scene simulation program was developed and used to determine the effects of scene heterogeneity, resolution, frequency, look angle, and surface and temperature relations on the performance of a spaceborne passive microwave system designed to estimate soil water information. The ground scene is based on classified LANDSAT images which provide realistic ground classes, as well as geometries. It was determined that the average sensitivity of antenna temperature to soil moisture improves as the antenna footprint size increased. Also, the precision (or variability) of the sensitivity changes as a function of resolution. M.G.

N82-25606*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

FOREST RESOURCE INFORMATION SYSTEM. PHASE 3: SYSTEM TRANSFER REPORT Final Report, 1 Apr. 1979 - 31 Dec. 1980

R. P. Mroczynski, Principal Investigator 30 Jul. 1981 142 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS

(Contract NAS9-15325)

(E82-10344; NASA-CR-167544; NAS 1.26:167544; LARS-073081) Avail: NTIS HC A07/MF A01 CSCL 02F

Transfer of the forest reserve information system (FRIS) from the Laboratory for Applications of Remote Sensing to St. Regis Paper Company is described. Modifications required for the transfer of the LARYS image processing software are discussed. The reformatting, geometric correction, image registration, and documentation performed for preprocessing transfer are described. Data turnaround was improved and geometrically corrected and ground-registered CCT LANDSAT 3 data provided to the user. The technology transfer activities are summarized. An application test performed in order to assess a Florida land acquisition is described. A benefit/cost analysis of FRIS is presented. J.D.

N82-25607*# Utah Univ., Salt Lake City. Center for Remote Sensing and Cartography.

INVENTORY OF WETLANDS AND AGRICULTURAL LAND COVER IN THE UPPER SEVIER RIVER BASIN, UTAH

Richard A. Jaynes, Lincoln D. Clark, Jr., and Keith F. Landgraf, Principal Investigator 31 Oct. 1981 40 p refs ERTS

(Grant NAGw-95)

(E82-10345; NASA-CR-168961) Avail: NTIS HC A03/MF A01 CSCL 08B

The use of color infrared aerial photography in the mapping of agricultural land use and wetlands in the Sevier River Basin of south central Utah is described. The efficiency and cost effectiveness of utilizing LANDSAT multispectral scanner digital data to augment photographic interpretations are discussed. Transparent overlays for 27 quadrangles showing delineations of wetlands and agricultural land cover were produced. A table summarizing the acreage represented by each class on each quadrangle overlay is provided. J.D.

N82-25608*# National Aeronautics and Space Administration, Washington, D. C.

PLAN OF RESEARCH FOR INTEGRATED SOIL MOISTURE STUDIES. RECOMMENDATIONS OF THE SOIL MOISTURE WORKING GROUP

Oct. 1980 111 p refs

(NASA-TM-84731; NAS 1.15:84731) Avail: NTIS HC A06/MF A01 CSCL 08M

Soil moisture information is a potentially powerful tool for applications in agriculture, water resources, and climate. At present, it is difficult for users of this information to clearly define their needs in terms of accuracy, resolution and frequency because of the current sparsity of data. A plan is described for defining and conducting an integrated and coordinated research effort to develop and refine remote sensing techniques which will determine spatial and temporal variations of soil moisture and to utilize soil moisture information in support of agricultural, water resources, and climate applications. The soil moisture requirements of these three different application areas were reviewed in relation to each other so that one plan covering the three areas could be formulated. Four subgroups were established to write and compile the plan, namely models, ground-based studies, aircraft experiments, and spacecraft missions. A.R.H.

N82-25609*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SEA-ICE MISSION REQUIREMENTS FOR THE US FIREX AND CANADA RADARSAT PROGRAMS

F. D. Carsey, R. O. Ramseier (Atmospheric Environment Service), and W. F. Weeks (Army Cold Regions Research and Engineering Lab., Hanover, New Hampshire) Jan. 1982 83 p refs Presented at Bilateral Ice Study Team Workshop, Cornwall, Ontario, 11-13 Feb. 1981

(Contract NAS7-100)

(NASA-CR-168984; NAS 1.26:168984) Avail: NTIS HC A05/MF A01 CSCL 08F

A bilateral synthetic aperture radar (SAR) satellite program is defined. The studies include addressing the requirements supporting a SAR mission posed by a number of disciplines including science and operations in sea ice covered waters. Sea ice research problems such as ice information and total mission requirements, the mission components, the radar engineering parameters, and an approach to the transition of spacecraft SAR from a research to an operational tool were investigated. S.L.

N82-25610*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

RADIOMETER MISSION REQUIREMENTS FOR LARGE SPACE ANTENNA SYSTEMS

Lloyd S. Keafer, Jr., Paul Swanson, and Jerome Eckerman May 1982 64 p refs

(NASA-TM-84478; NAS 1.15:84478) Avail: NTIS HC A04/MF A01 CSCL 20N

Requirements are defined for Earth observational microwave radiometry using large space antenna systems with apertures in the 50 to 200 meter range. General Earth observational needs, specific measurement requirements, orbital mission guidelines and constraints, and general radiometric requirements are defined. Specific measurements include soil moisture, water surface temperature, water roughness, ice boundaries, salinity, and water pollutants. Measurements with 10 to 1 km spatial resolution and 3 to 1 day temporal resolution are required. Author

N82-25611# University of Southern California, Los Angeles. Image Processing Inst.

IMAGE UNDERSTANDING RESEARCH Final Technical Report, 1 Apr. - 30 Sep. 1981

Ramakant Nevatia and Alexander A. Sawchuk 30 Sep. 1981 138 p refs

(Contract F33615-80-C-1080; DARPA Order 3119)

(AD-A110746; USCIPI-1050) Avail: NTIS HC A07/MF A01 CSCL 05/8

This technical report summarizes the image understanding and VLSI system research activities performed by the University of Southern California and the Hughes Research Laboratories during 1 April 1981 through 30 September 1981 under contract number F-33615-80-C-1080 with the Defense Advanced Research Projects Agency, Information Processing Techniques Office. The purpose of this research program is to develop techniques and systems for understanding images, particularly for mapping applications. The research activity includes low level image analysis and feature extraction, statistical and structural texture analysis, symbolic image representations, and image to map correspondence using relational structures. Additional activity is concerned with VLSI architectures for implementation of image analysis and image understanding operations. GRA

N82-25612# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Aerospace Cartography Dept.

MATRIX DATA ANALYSIS: COLOR/B AND W CODING IS NOT ALWAYS ENOUGH Interim Report, 1976 - 1981

Marshall B. Faintich, George B. Sigler, and James D. Simpson 1981 31 p refs Presented at the Inter-Congr. Symp., Inter. Soc. of Phot. and Remote Sensing Comm. 3, Otaniemi, Finland, 7-11 Jun. 1982

(AD-A111401) Avail: NTIS HC A03/MF A01 CSCL 08/2

The Defense Mapping Agency produces digital data bases that describe the physical appearance of the surface of the Earth. These data bases include, but are not limited to, terrain elevation, culture including landscape characteristics and vertical features. This data is collected from digitized source maps, from optically or digitally correlated stereo-pairs of photographic imagery, and from digital multi-spectral sensor data. A dramatic impact has been made in the ability to analyze these digital data bases by applying state-of-the-art digital image technology processing and display concepts. These include a variety of color and/or black and white displays of not only intensity/color coded matrix data, but also image processed data using specialized convolution filters, texture discrimination, and special color representation techniques. In addition, computer generated imagery from these data bases serves as a final analysis tool. GRA

N82-25613# Measurement Concept Corp., Rome, N. Y.

SOURCE ASSESSMENT SYSTEM Final Technical Report

Roy H. Senn, M. Lynn Taylor, Richard Burns, and Michael Smith Griffiss AFB, N.Y. RADC Nov. 1981 153 p refs

(Contract F30602-80-C-0040; AF Proj. 4303)

(AD-A111223; RADC-TR-81-303) Avail: NTIS HC A08/MF A01 CSCL 09/2

This report contains an analysis of the Source Assessment Procedures at both Defense Mapping Agency (DMA) production facilities (Aerospace Center DMAAC in St. Louis MO and Hydrographic Topographic Center DMAHTC in Washington DC). Following the analysis, the report documents a design trade off of various approaches to a Source Assessment System. Finally, a Design Plan for the selected approach analog-digital video system, is presented. Author (GRA)

N82-25614# Army Engineer Topographic Labs., Fort Belvoir, Va.

COORDINATION OF STEREO IMAGE REGISTRATION AND PIXEL CLASSIFICATION Computer Sciences Lab.

Michael A. Crombie 20 Mar. 1982 10 p refs Presented at the ACSM-ASP Ann. Conv., Denver, 1982

(AD-A111307; ETL-R034) Avail: NTIS HC A02/MF A01 CSCL 14/5

An inadequate concept of how corresponding points relate to one another on dissimilar images has a greater effect than exposure geometry or data collection on registration problems in stereo photogrammetry. Conventional correlation, or one of its relatives, is the measure of similarity used in all automated stereo correlation systems. Correlation, a measure of the linear dependence between two sets of data, is an inadequate measure when there is less than, or more than, a moderate amount of image structure at and around points selected for image matching. The existence of structure should be recognized and utilized in an appropriate manner for image matching. Similarly, the absence of structure should be recognized, and the surrounding imagery should be used to complete matches where it is possible. The concurrent determination of what a pixel is, as well as where it is, can alleviate much of the registration problem. A variety of features including point-density data, texture, and edges, as well as existing cartographic knowledge, can be combined and organized through rules in order to more completely describe a point. The overall throughput of the compilation process will be improved in both time and accuracy if those functions which tend to support one another are concurrently, rather than sequentially, performed. If the compilation process takes place in image space, then the image matching operation as well as the other feature extraction operations, can be ordered by the data processing manager to best suit the function of the process. Author (GRA)

N82-25615# Army Engineer Topographic Labs., Fort Belvoir, Va.

A NAMES INPUT STATION FOR AUTOMATED FOREIGN NAMES PRODUCTION AT THE UNITED STATES DEFENSE MAPPING AGENCY

Douglas R. Caldwell 29 Jan. 1982 17 p ref

(AD-A110926; ETL-R032) Avail: NTIS HC A02/MF A01 CSCL 09/2

The United States Defense Mapping Agency is the federal organization charged with maintaining foreign names information. The Foreign Place Names File contains references to more than 3.5 million approved and 1.5 million variant names for foreign countries, undersea features, and extra-terrestrial features. The file is currently stored on index cards, because existing computer equipment has not been capable of displaying and processing the diacritics and special symbols characteristic of the extended Latin alphabet. In a joint effort with the US Army Engineer Topographic Laboratories and the Illinois Institute of Technology and Research Institute, the United States Defense Mapping Agency is developing a prototype Names Input Station to digitally process foreign names data. The station can input, output, edit, and display diacritics and special symbols for the over one hundred romanized non-English languages required by the agency. Author (GRA)

N82-25616# Los Alamos Scientific Lab., N. Mex.

EVALUATION OF THE SECOND HOT DRY ROCK GEOTHERMAL ENERGY RESERVOIR: RESULTS OF PHASE 1, RUN SEGMENT 5

G. A. Zyvoloski, R. L. Aamodt, R. G. Aguilar, D. A. Counce, H. N. Fisher, T. A. Grant (Zia Co., Los Alamos, N.Mex.), C. O. Grigsby, R. H. Hendron, C. E. Holley, Jr., and R. G. Lawson Sep. 1981 99 p refs

(Contract W-7405-eng-36)

(DE82-002520; LA-8940-HDR) Avail: NTIS HC A05/MF A01

The results of a long term (286 day) flow test of a second hot dry rock reservoir are presented. This second reservoir was created by fracturing an interval of granitic rock located at a depth of 2.93 km (9620 ft) in the same wellbore pair used in the creation of the first, smaller reservoir. The new fracture system has a vertical extent of at least 320 m (1050 ft), suggesting that the combined heat transfer area of the old and new fracture systems is much greater than that of the old system. The virgin rock temperature at the bottom of the deeper interval was 1970 C (3860 F). Downhole measurements of the water temperature at the reservoir outlet, as well as temperatures inferred from geothermometry, showed that the thermal drawdown of the reservoir was about 80 C, and preliminary estimates indicate that the minimum effective heat transfer area of the new reservoir is 45,000 sq m (480,000 sq ft), which is six times larger than the first reservoir. DOE

N82-25617# Los Alamos Scientific Lab., N. Mex.

INVESTIGATIONS OF LOW-TEMPERATURE GEOTHERMAL POTENTIAL IN NEW YORK STATE

Dennis S. Hodge, Robert DeRito (State Univ. of New York, Buffalo), Kenneth Mifiker (State Univ. of New York, Buffalo), Paul Morgan, and Chandler A. Swanberg Sep. 1981 76 p refs
(Contract W-7405-eng-36)
(DE82-002517; LA-8960-MS) Avail: NTIS HC A05/MF A01

Temperature gradient map and published heat flow data indicate a possible potential for a geothermal resource in western and central New York State. An analysis of bottom hole temperature data for New York State confirm the existence of three positive gradient anomalies: the East Aurora, Cayuga, and Elmira anomalies, with gradients as high as 320 C/km, 360 C/km, and 360 C/km, respectively. Ground waters from two of these anomalies are enriched in silica relative to surrounding areas. Heat flows based on silica geothermometry are 50 to 70 sq mWm (+2) for the anomalies and 41.4 sq mWm (+2) for bordering regional flux. A correlation between Bougner gravity anomalies and the temperature gradient map suggests that the geothermal anomalies may occur above radioactive granites in the basement. DOE

N82-25618# Mid-American Solar Energy Complex, Minneapolis, Minn.
ECONOMIC SUMMARY OF NON-WOODY AGRICULTURAL BIOMASS
Sep. 1981 59 p refs
(Contract DE-AC02-78CS-30150)
(DE82-001714; B-102-2) Avail: NTIS HC A04/MF A01

The state-of-the-art research in the area of non-woody agricultural biomass use in low temperature direct combustion/gasification applications is summarized. Five economic issues of relevance to the total spectrum of non-woody agricultural biomass from production to utilization are emphasized. The resource base is discussed in terms of production, usability, environmental effects and the costs of using non-woody biomass. The agricultural biomass harvesting and transportation systems which might be used and their costs and the storage of non-woody agricultural biomass are discussed. The utilization of non-woody agricultural biomass and the demands that may be met with this product as a heat energy source are described. Also discussed is equipment availability for non-woody agricultural biomass combustion uses and the economics of combustion as presented in various studies. The final section is a summary and evaluation of the overall application of non-woody agricultural biomass. T.M.

N82-25619# Mid-American Solar Energy Complex, Minneapolis, Minn.
PAST AND PRESENT TRENDS OF AGRICULTURAL PRODUCTION AND CROP RESIDUES AVAILABLE FOR REMOVAL IN THE MID-AMERICAN REGION
J. H. Posselius, Jr. Sep. 1981 357 p refs
(Contract DE-AC02-79CS-30150)
(DE82-001715; MASEC-R-81-066) Avail: NTIS HC A16/MF A01

Past and present trends of agricultural production in the MASEC region are discussed. Crop residues available for removal in the MASEC region are also discussed. Agricultural crop and livestock production levels and trends are analyzed by crop and livestock type on a state level basis. The resource base is divided into three main categories: starch crops, sugar crops and livestock. The term starch crops refers to crops which are currently grown in significant acreage in the North Central region, such as: barley, beans, corn, oats, rice, rye, grain sorghum, sunflowers and wheat. The term sugar crops refers to; sugar beets and sweet sorghum, and the term livestock refers to; cattle, dairy, hogs, chickens and turkeys. The states that comprise the North Central region includes: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota and Wisconsin. The amount of crop residue available for removal in the MASFEC region is estimated by crop type, on a county and state level basis. Wind and water erosion are considered as are nutrient losses and the net energy aspects of residue removal. Author

N82-25620# High Life Helicopters, Inc., Puyallup, Wash.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY, TORONTO QUADRANGLE NEW YORK, VOLUME 2A Final Report
1981 90 p refs Prepared in cooperation with QEB, Inc. 3 Vol.
(Contract DE-AC13-79GJ-01692)
(DE81-027158; GJBX-211-81-Vol-2A) Avail: NTIS HC A05/MF A01

No uranium anomalies meet the minimum statistical requirements as defined and no anomaly map is presented. Potassium (%K), equivalent Uranium (ppm eU), equivalent Thorium (ppm eTh), eU/eTh, eU/K, eTh/K, and magnetic pseudo-contour maps are presented. Stacked Profiles showing geologic strip maps along each flight-line, together with sensor data, and ancillary data are also presented. All maps and profiles were prepared on a scale of 1:250,000, but were reduced to 1:500,000 for presentation. DOE

N82-25621# High Life Helicopters, Inc., Puyallup, Wash.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY, KINGSTON QUADRANGLE NEW YORK, VOLUME 2C Final Report
1981 64 p refs Prepared in cooperation with QEB, Inc. 3 Vol.
(Contract DE-AC13-79GJ-01692)
(DE81-027161; GJBX-211-81-Vol-2C) Avail: NTIS HC A04/MF A01

No uranium anomalies meet the minimum statistical requirements as defined. No Uranium Anomaly Map is given. Potassium (%K), equivalent Uranium (ppm eU), equivalent Thorium (ppm eTh), eU/eTh, eU/K, eTh/K, and magnetic pseudo-contour maps are presented. Stacked Profiles showing geologic strip maps along each flight-line, together with sensor data, and ancillary data are also presented. All maps and profiles were prepared on a scale of 1:250,000, but were reduced to 1:500,000 for presentation. DOE

N82-25622# High Life Helicopters, Inc., Puyallup, Wash.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY, ROCHESTER QUADRANGLE NEW YORK, VOLUME 2D Final Report
1981 143 p refs Prepared in cooperation with QEB, Inc. 3 Vol.
(Contract DE-AC13-79GJ-01692)
(DE81-027156; GJBX-211-81-Vol-2D) Avail: NTIS HC A07/MF A01

One uranium anomaly met the minimum statistical requirements as defined. This anomaly is listed and is shown on the Uranium Anomaly Interpretation Map. Potassium (%K), equivalent Uranium (ppm eU), equivalent Thorium (ppm eTh), eU/eTh, eU/K, eTh/K, and magnetic pseudo-contour maps are also presented. Stacked Profiles showing geologic strip maps along each flight-line, together with sensor data, and ancillary data are presented. All maps and profiles were prepared on a scale of 1:250,000, but were reduced to 1:500,000 for presentation. Anomaly number 1 is over an area underlain by shale and dolomite of the upper Silurian Camillus and Syracuse formations (Scy). DOE

N82-25623# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY. BARROW QUADRANAGLE, ALASKA, VOLUME 2 Final Report
Mar. 1981 63 p refs 2 Vol.
(Contract DE-AC13-76GJ-01664)
(DE82-000342; GJBX-295-81-Vol-2) Avail: NTIS HC A04/MF A01

Volume II contains the flight path map, multiparamenter profiles, histograms, and anomaly maps for potassium, uranium, thorium, uranium/potassium, uranium/thorium, and thorium/potassium. GRA

N82-25624# Los Alamos Scientific Lab., N. Mex.
METHANE HYDRATE RESOURCE ASSESSMENT PROGRAM Progress Report, Jul. - Sep. 1980
Bruce L. Barraclough, Patrick L. McGuire, and S. P. Koczan Sep. 1981 36 p refs
(Contract W-7405-eng-36)
(DE82-002478; LA-8933-PR; QR-2) Avail: NTIS HC A03/MF A01

Progress on a program to study the nature, occurrence, and resource potential of methane (natural gas) hydrate is described. Planning for an experimental field program is continuing and a range of feasible field efforts is outlined. A variety of methods and equipment suitable for hydrate coring work was identified. A new cryogenic wireline coring system, which is intended for use with very cold drilling fluids, was developed for retrieving hydrated samples from subsurface strata, and details are presented. A unique concept for forming hydrate in the pore space of various sediments is outlined, and details of the proposed experimental apparatus are given. Continuing studies of hydrate gas production by thermal stimulation methods indicate that steam injection is not practical. Two reservoir computer models were developed, which are believed to bracket probably hydrate gas production rates. These models are discussed and the preliminary results of reservoir parameter studies are presented. DOE

N82-25625# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY. LOOKOUT RIDGE QUADRANGLE, ALASKA, VOLUME 2 Final Report
Feb. 1981 190 p refs 2 Vol.
(Contract DE-AC13-76GJ-01664)
(DE82-000313; GJBX-303-81-Vol-2) Avail: NTIS HC A09/MF A01

The flight path map, multiparameter profiles, histograms, and anomaly maps are included. Uranium, thorium, potassium, uranium/potassium, uranium/thorium, and thorium/potassium are investigated. DOE

N82-25626# Danish Meteorological Inst., Copenhagen.
INVESTIGATIONS OF SNOW COVER IN THE STEVNS INTERNATIONAL HYDROLOGICAL DECADE REPRESENTATIVE BASIN, WINTER 1977 TO 1978
Peter Allerup, Bent Hasholt, and Henning Madsen 1980 23 p refs
(DMI-Climatol-Papers-6; ISBN-87-7478-170-7) Avail: NTIS HC A02/MF A01

Ways of estimating the water equivalent of snow in drainage basins are discussed. Data from a two-stage random sampling technique in a regular grid with 3 km long sides are analyzed. Accuracy is improved by applying an optimal stratification based on land use categories (surface types). Land use must be surveyed before the snowfall, or land use must be constant from one year to the next. Measurements in an open beech forest can be used for determining the water equivalent in the whole basin if evaporation and snowmelt in the whole area are negligible. Author (ESA)

N82-25627# Geological Survey, Helena, Mont.
MEAN ANNUAL STREAMFLOW OF SELECTED DRAINAGE BASINS IN THE COAL AREA OF SOUTHEASTERN MONTANA Final Water Resources Investigations
Rodger F. Ferreira Oct. 1981 28 p refs Prepared in cooperation with EPA
(PB82-137696; USGS/WRD/WRI-81/097; USGS/WRI-81-61) Avail: NTIS HC A03/MF A01 CSCL 08H

Streamflow characteristics of drainage basins within the Fort Union coal region of southeastern Montana were estimated to provide premining data for evaluating the future effects of mining on the environment. Estimated annual mean streamflow at 22 data collection stations ranged from 0 to 887 cubic feet per second. These estimates are based on miscellaneous streamflow records at each station and continuous streamflow records from other stations in the study area. Estimated mean annual streamflow for a 10 year period ranged from 0 to 572 cubic feet per second. Many of the drainage basins had a mean annual runoff of less than 0.60 inch; the maximum observed mean annual runoff was 4.45 inches. GRA

N82-25628# Geological Survey, Tallahassee, Fla. Water Resources Div.
WATER RESOURCES DATA FOR FLORIDA. VOLUME 4: NORTHWEST FLORIDA Annual Water-Data Report, 1 Oct. 1979 - 30 Sep. 1980
Aug. 1981 714 p refs Sponsored in part by State of Florida 4 Vol.
(PB82-136128; USGS/WRD/HD-81/082; USGS/WDR/FL-80/4) Avail: NTIS HC A99/MF A01 CSCL 08H

Water resource data for northwest Florida for 1980 is reported. It includes continuous or daily discharge for 64 streams, periodic discharge for 18 streams, peak discharge for 36 streams, continuous or daily stage for 4 streams and periodic stage for 0 streams; continuous elevations for 4 lakes and periodic elevations for 18 lakes; continuous ground water levels for 40 wells, periodic ground water levels for 115 wells, and miscellaneous water level measurements for 295 wells; quality of water for 36 surface water sites and for 113 wells. GRA

N82-25629# Geological Survey, Indianapolis, Ind. Water Resources Div.
WATER RESOURCES DATA FOR INDIANA, WATER YEAR 1980 Annual Water-Data Report, 1 Oct. 1979 - 30 Sep. 1980
Jun. 1981 432 p
(PB82-135930; USGS/WRD/HD-80/059; USGS/WRD/IN-80/1) Avail: NTIS HC A19/MF A01 CSCL 08H

Water resources data for the 1980 water year for Indiana consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels in wells. This report contains discharge records for 185 gaging stations; stage and contents for 12 lakes and reservoirs; releases from 6 flood-control reservoirs; water quality for 51 gaging stations; and water levels for 79 observation wells. Also included are 97 crest-stage partial-record stations and 69 low-flow partial-record stations. GRA

N82-25630# Geological Survey, Tallahassee, Fla. Water Resources Div.
BOREHOLE DATA-COLLECTION METHODS APPLICABLE FOR THE REGIONAL OBSERVATION AND MONITOR WELL PROGRAM, SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT Water-Resources Investigations
John J. Hickey Sep. 1981 16 p refs Prepared in cooperation with Southwest Florida Water Management District
(PB82-133448; USGS/WRD/WRI-81/093; USGS/WRI-81-57) Avail: NTIS HC A02/MF A01 CSCL 08H

Management of ground-water resources within the Southwest Florida Water Management District requires that hydrogeologic characteristics of waterbearing rocks and quality characteristics of water be described. Wells for the District's Regional Observation and Monitor Well Program are drilled specifically to collect data to describe the groundwater resource. Borehole data-collection methods for these wells include drilling in stages; running geophysical logs at the completion of each stage; collection of water-level and specific-conductance data before, during, and after a day's drilling; specific-capacity determinations after a day's drilling; and placing a packer in the gypsiferous and anhydritic limestone and dolomite for water-level and water-quality data. GRA

N82-25631# Forest Service, Asheville, N.C. Southeastern Forest Experiment Station.
BIOMASS IN SOUTHEASTERN FORESTS
Joe P. McClure, Joseph R. Saucier, and R. C. Biesterfeldt Sep. 1981 41 p refs
(PB82-133422; SEFES-81-26) Avail: NTIS HC A03/MF A01 CSCL 02F

The 88.5 million acres of commercial forest land in the southeast contain some 6.2 million green tons of woody biomass. Distribution of this material is reported by State, tree size and tree species. Relative amounts in various portions of typical trees are also reported for major species groups. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N82-25632 International Institute for Applied Systems Analysis, Laxenburg (Austria).

THE ENERGY SUPPLY MODEL MESSAGE

Leo Schrattenholzer Dec. 1981 41 p refs

(RR-81-31; ISBN-3-7045-0024-0) Copyright. Avail: Issuing Activity

A dynamic linear programming model that minimizes the total discounted costs of supplying a given set of energy demands over a given time is introduced. It balances secondary energy demand, disaggregated into sectors and exogenous to the model, with primary energy supply, a set of resource availabilities disaggregated into an optional number of cost categories by choosing from a set of energy conversion technologies. Model constraints reflect the limited speed of build up of technologies, the limited annual availability of resources, and technological relationships. The model defines load regions (e.g., for electricity demand), distinguishes between indigenous and imported resources, and optionally includes environmental impacts in the objective function. It can be applied to global or smaller scale scenarios. Author (ESA)

N82-25633# Committee on Science and Technology (U. S. House).

SUMMARY OF HEARINGS ON THE FUTURE OF THE NATION'S ENERGY UTILITIES: IMPLICATIONS FOR FEDERAL RD&D

Karen Nelson and Fred J. Sissine Washington GOP 1982 45 p Presented to The Subcomm. on Energy Develop. and Appl. of the Comm. on Sci. and Technol., 97th Congr., 2nd Sess., Mar. 1982 Prepared by the Library of Congr., Congr. Res. Serv.

(GPO-91-815) Avail: Subcommittee on Energy Development and Applications

Hearings on the future of the nation's energy utilities are summarized. The future strategies of energy utilities in regard to new technologies are considered. Alternate energy technologies, conservation, diversification, deregulation, and various regulatory reforms are explored. N.W.

N82-25634# Committee on Science and Technology (U. S. House).

NATIONAL ENERGY CONSERVATION POLICY UNDER THE REAGAN ADMINISTRATION: ANALYSIS OF HEARINGS ON THE DEPARTMENT OF ENERGY AUTHORIZATION FOR FISCAL YEAR 1982

Fred J. Sissine Washington GPO 1982 58 p Presented to the Subcomm. on Energy Develop. and Appl. of the Comm. on Sci. and Technol., 97th Congr., 2nd Sess., Mar. 1982. Prepared by the Library of Congr., Congr. Res. Serv.

(GPO-92-174) Avail: Subcommittee on Energy Development and Applications

Some of the major issues in energy conservation policy are summarized, including the significance of energy conservation to the national economy, foreign competition, and the prospects for increased private and local government participation. The role of the Federal Government in energy conservation, outreach, and information dissemination is discussed. R.J.F.

N82-25635*# Detroit Diesel Allison, Indianapolis, Ind.

LOW NOx HEAVY FUEL COMBUSTOR CONCEPT PROGRAM Final Report

A. S. Novick and D. L. Troth Oct. 1981 206 p refs

(Contracts DEN3-148; DE-AI01-77ET-13111)

(NASA-CR-165367; NAS 1.26:165367; DDA-EDR-10594; DOE/NASA/0148-1) Avail: NTIS HC A10/MF A01 CSCL 10B

The development of the technology required to operate an industrial gas turbine combustion system on minimally processed, heavy petroleum or residual fuels having high levels of fuel-bound nitrogen (FBN) while producing acceptable levels of exhaust emissions is discussed. Three combustor concepts were designed and fabricated. Three fuels were supplied for the combustor test demonstrations: a typical middle distillate fuel, a heavy residual fuel, and a synthetic coal-derived fuel. The primary concept was an air staged, variable-geometry combustor designed to produce low emissions from fuels having high levels of FBN. This combustor used a long residence time, fuel-rich primary combustion zone followed by a quick-quench air mixer to rapidly dilute the fuel rich products for the fuel-lean final burnout of the fuel. This combustor, called the rich quench lean (RQL) combustor, was extensively tested using each fuel over the entire power range of the model 570 K engine. Also, a series of parameteric tests was conducted to determine the combustor's sensitivity to rich-zone equivalence ratio, lean-zone equivalence ratio, rich-zone residence time, and overall system pressure drop. Minimum nitrogen oxide emissions were measured at 50 to 55 ppmv at maximum continuous power for all three fuels. Smoke was less than a 10 SAE smoke number. M.G.

N82-25636*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

IMPACT OF UNIFORM ELECTRODE CURRENT DISTRIBUTION ON ETF

David J. Bents 1982 10 p refs Presented at the 20th Aerospace Sci. Meeting, Orlando, Fla., 11-14 Jan 1982

(Contract DE-AI01-77ET-10769)

(NASA-TM-82875; E-1044; NAS 1.15:82875; DOE/NASA/10769-24) Avail: NTIS HC A02/MF A01 CSCL 10A

The design impacts on the ETF electrode consolidation network associated with uniform channel electrode current distribution are examined and the alternate consolidation design which occur are presented compared to the baseline (non-uniform current) design with respect to performance, and hardware requirements. A rational basis is given for comparing the requirements for the different designs and the savings that result from uniform current distribution. Performance and cost impacts upon the combined cycle plant are discussed. Author

N82-25637*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NASA REDOX SYSTEM DEVELOPMENT PROJECT STATUS

A. W. Nice 1981 18 p refs Presented at the 4th Battery and Electrochem. Contractors Conf., Washington, 2-4 Jun. 1981

(Contract DE-AI01-80AL-12726)

(NASA-TM-82665; E-939; DOE/NASA/12726-9; NAS 1.15:82665) Avail: NTIS HC A02/MF A01 CSCL 10A

NASA-Redox energy storage systems developed for solar power applications and utility load leveling applications are discussed. The major objective of the project is to establish the technology readiness of Redox energy storage for transfer to industry for product development and commercialization by industry. The approach is to competitively contract to design, build, and test Redox systems progressively from preprototype to prototype multi-kW and megawatt systems and conduct supporting technology advancement tasks. The Redox electrode and membrane are fully adequate for multi-kW solar related applications and the viability of the Redox system technology as demonstrated for multi-kW solar related applications. The status of the NASA Redox Storage System Project is described along with the goals and objectives of the project elements. Author

N82-25638*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

FSA FIELD TEST Annual Report, Aug. 1980 - Aug. 1981

Peter Jaffe, Robert W. Weaver, and Robert E. Lee 15 Dec. 1981 49 p

(Contracts NAS7-100; DE-AI01-76ET-20356)

(NASA-CR-168991; DOE/JPL-1012-59; JPL-Pub-81-99; NAS 1.26:168991) Avail: NTIS HC A03/MF A01 CSCL 10A

The 12 continental remote sites were decommissioned. Testing was consolidated into a five-site network consisting of

the four Southern California sites and a new Florida site. 16 kW of new state-of-the-art modules were deployed at the five sites. Testing of the old modules continued at the Goldstone site but as a low-priority item. Array testing of modules is considered. Additional new testing capabilities were added. A battery-powered array data logger is discussed. A final set of failure and degradation data was obtained from the modules. Author

N82-25639*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DISH CONCENTRATORS FOR SOLAR THERMAL ENERGY: STATUS AND TECHNOLOGY DEVELOPMENT
L. D. Jaffe 1 Jan 1982 69 p refs Presented at the 2nd Terrestrial Energy Systems Conf., Colorado Springs, 1-3 Dec. 1981
(Contracts NAS7-100; DE-AT04-81AL-16228)
(NAS 1.26:168994) Avail: NTIS HC A04/MF A01 CSCL 10A

Point-focusing concentrators under consideration for solar thermal energy use are reviewed. These concentrators differ in such characteristics as optical configuration, optical materials, structure for support of the optical elements and of the receiver, mount, foundation, drive, controls and enclosure. Concentrator performance and cost are considered. Technology development is outlined, including wind loads and aerodynamics; precipitation, sand, and seismic considerations; and maintenance and cleaning. Author

N82-25640*# Giner, Inc., Waltham, Mass.
REQUIREMENTS FOR OPTIMIZATION OF ELECTRODES AND ELECTROLYTE FOR THE IRON/CHROMIUM REDOX FLOW CELL Final Report
Vinod Jalan, Herbert Stark, and Jose Giner Sep. 1981 82 p refs
(Contracts DEN3-97; DE-AI04-80AL-12726)
(NASA-CR-165218; DOE/NASA/0097-80/1; NAS 1.26:165218) Avail: NTIS HC A05/MF A01 CSCL 10C

Improved catalyzation techniques that included a pretreatment of carbon substrate and provided normalized carbon surface for uniform gold deposition were developed. This permits efficient use of different batches of carbon felt materials which initially vary significantly in their physical and surface chemical properties, as well as their electrochemical behavior. Further modification of gold impregnation technique gave the best performing electrodes. In addition to the linear sweep voltammetry, cyclic voltammetry was used to determine the effects of different activation procedures on the Cr(3)/Cr(2) Redox and H2 evolution reactions. The roles of carbon, gold and lead in the overall Redox cycle are identified. The behavior of the electrodes at both normal battery operating potentials and more extreme potentials is discussed preparing efficient and stable electrodes for the energy storage battery is implicated. E.A.K.

N82-25641*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THERMAL PERFORMANCE OF A PHOTOGRAPHIC LABORATORY PROCESS: SOLAR HOT WATER SYSTEM
John A. Walker and Ronald N. Jensen Apr. 1982 22 p
(NASA-TM-83299; NAS 1.15:83299) Avail: NTIS HC A02/MF A01 CSCL 10A

The thermal performance of a solar process hot water system is described. The system was designed to supply 22,000 liters (5,500 gallons) per day of 66 C (150 F) process water for photographic processing. The 328 sq m (3,528 sq. ft.) solar field has supplied 58% of the thermal energy for the system. Techniques used for analyzing various thermal values are given. Load and performance factors and the resulting solar contribution are discussed. S.L.

N82-25642*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SATELLITE POWER SYSTEM. CONCEPT DEVELOPMENT AND EVALUATION PROGRAM. VOLUME 4: ENERGY CONVERSION AND POWER MANAGEMENT
Nov. 1981 366 p refs
(NASA-TM-58237; NAS 1.15:58237) Avail: NTIS CSCL 10A

Analyses performed for the satellite power system (SPS) reference system concept are presented. The reference concept together with descriptions of energy conversion, power distribution, and power management for solar photovoltaics, solar thermal, and concept comparisons are reviewed. Studies on energy conversion and power management (environmental impacts, annealing, nuclear SPS concept, and thermionic) are also reported. E.A.K.

N82-25643# Naval Research Lab., Washington, D. C. Inorganic and Electrochemistry Branch.
RESEARCH ON LEAD ACID BATTERY ELECTRODES Final Report
A. C. Simon, S. M. Caulder, C. P. Wales, and R. L. Jones 26 Feb. 1982 105 p refs
(Contracts EC-76-A-31-1003; DE-AP03-80SF-11185)
(AD-A111453; NRL-MR-4751) Avail: NTIS HC A06/MF A01 CSCL 10/3

The reactions and physical and molecular transformations that occur in lead acid battery plate active material during charge-discharge cycling have been studied under a DOE program to improve the lead acid battery for electric vehicle applications. Investigations included structural studies of PbO2 by X-ray/neutron diffraction, effects of cycling on capacity by pulsed vs unpulsed discharge, active material microstructure/plate capacity changes under high EV-type discharge rates, 'coralloid' structure formation in cycled positive plates, and tubular plate active material changes during formation and cycling. Author (GRA)

N82-25644# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THEORETICAL ANALYSIS OF AN AlGaAs/AlGaAs HETERO-FACE BACK-BARRIER SOLAR CELL M.S. Thesis
David J. Miazza Dec. 1981 72 p refs
(AD-A111174; AFIT/GEO/PH/81D-4) Avail: NTIS HC A04/MF A01 CSCL 10/2

A solar cell with a high band gap window, a homojunction, and a back-barrier on a base has been analyzed theoretically under fairly general conditions. The carrier transport equations were solved to obtain the short circuit current density. The theoretical results are applicable to similarly structured cells made from other materials. Although there is a lack of data on the properties of AlGaAs, many of the properties of AlGaAs have been modeled in this report by drawing on the work of others. The AlGaAs solar cell was modeled on a computer and certain design parameters (such as Al content) varied in order to examine their effects. Author (GRA)

N82-25645# Aerospace Corp., El Segundo, Calif. Laboratory Operations Office.
IMPEDANCE OF AEROSPACE NiCd CELLS UNDER OPEN CIRCUIT CONDITIONS Interim Report
A. H. Zimmerman 25 Jan. 1982 29 p refs
(Contract F04701-81-C-0082)
(AD-A111687; TR-0082(2945-01)-1; SD-TR-81-109) Avail: NTIS HC A03/MF A01 CSCL 10/3

The open circuit impedance of 10-A h sealed NiCd cells has been measured from 0 to 100.00 Hz as a function of cell state of charge and temperature. The open-circuit impedance at frequencies below 0.01 Hz is modeled by two consecutive diffusion-controlled charge transfer processes in the NiCd cell. Data analysis indicates that both solid-state diffusion processes and electrolyte diffusion processes are consistent with the data. Because concentration polarization is known to occur in NiCd cells, the two observed processes are tentatively assigned to electrolyte diffusion in the positive and negative plates. The resolution of these processes in the impedance spectrum is sensitive to the relative pore structure and morphology of the electrode plates. Author (GRA)

N82-25646# Mid-American Solar Energy Complex, Minneapolis, Minn.
PASSIVE SOLAR CLASS B MONITORING REPORTS
Sep. 1981 35 p refs
(Contract DE-AC02-79CS-30150)
(DE82-003139; MASEC-R-81-016) Avail: NTIS HC A03/MF A01

A program for monitoring the performance of passive solar houses is briefly described relevant to the monthly monitoring reports. Equipment was installed in 3 houses, two in Iowa and

one in Wisconsin. The required contents of the monthly reports are outlined, and monthly reports are included from one Iowa and one Wisconsin site. Information includes a site summary sheet elevation and floor plan sketches, weather summary, daily data printout and thermal comfort. DOE

N82-25647# Mid-American Solar Energy Complex, Minneapolis, Minn.
EVALUATION FOR FY 1981 OF MASEC'S NEW RESIDENTIAL MULTI-FAMILY DWELLING PASSIVE SOLAR HEATING PROJECT
Sep. 1981 6 p refs
(Contract DE-AC02-70CS-30150)
(DE82-001206; MASEC-R-81-037; P-103-6) Avail: NTIS HC A02/MF A01

The program to form teams to design and build one passive solar building is discussed. Documentation of the process and the conducting of workshops on its design, construction, and marketing is described. DOE

N82-25648# Mid-American Solar Energy Complex, Minneapolis, Minn.
QUARTERLY REPORT OF SOLAR FEDERAL BUILDINGS: PROGRAM IN THE MASEC REGION
Sep. 1981 26 p
(Contract DE-AC02-79CS-30150)
(DE82-001185; MASEC-R-81-059/2; A-104-6) Avail: NTIS HC A03/MF A01

Activities concerning the short course on solar and energy conservation for buildings are reviewed. DOE

N82-25649# Mid-American Solar Energy Complex, Minneapolis, Minn.
EVALUATION OF THE SOLAR CITIES PROGRAM
JoAnn Musumeci Sep. 1981 10 p
(Contract DE-AC02-79CS-30150)
(DE81-030868; MASEC-R-81-044) Avail: NTIS HC A02/MF A01

The Grand Island Social Services Project, the Solar Utilities Conference, and Model Codes Workshops, and support services provided under this work package are described. Author

N82-25650# Mid-American Solar Energy Complex, Minneapolis, Minn.
RESIDENTIAL CONSERVATION SERVICE PROGRAM SUPPORT Final Report
Sep. 1981 11 p
(Contract DE-AC02-79CS-30150)
(DE82-001205; MASEC-R-81-080; A-102-4) Avail: NTIS HC A02/MF A01

Five tasks to research and prepare information for the Residential Conservation Program are described. The tasks are: preparing cost data on renewable program (specifically solar) measure; designing and publishing a consumer agency guide to advise consumers of preventive and corrective actions to take when contracting for home improvements; providing a report on financing residential energy improvements; designing solar industry information releases, specifically on solar water heaters; and preparing a brochure. DOE

N82-25651# Mid-American Solar Energy Complex, Minneapolis, Minn.
SUMMARY OF COMMERCIAL DEMONSTRATION PROJECTS
Sep. 1981 44 p
(Contract DE-AC02-79CS-30150)
(DE82-002278; MASEC-PA-81-055) Avail: NTIS HC A03/MF A01

Problem areas and successes of eighteen solar energy demonstration project sites are summarized. The design and construction phase is discussed first and then the components where problems occurred during operation are discussed. DOE

N82-25652# Mid-American Solar Energy Complex, Minneapolis, Minn.
NATIONAL SOLAR DATA NETWORK SUCCESS STORIES
Sep. 1981 22 p
(Contract DE-AC02-79CS-30150)
(DE82-002281; MASEC-R-81-058) Avail: NTIS HC A02/MF A01

Three of the most successful applications in the MASEC reporting region are described. The three sites are the Scattergood School site in West Branch, Iowa; the South Dakota School of Mines site located at the Mount Rushmore Memorial Visitor's Center in Keystone, South Dakota, and the Telex Communications site in Blue Earth, Minnesota. The first is a school recreation center, the second a park recreation center, and the third a business. All three are active systems and each exhibits a variety of approaches to providing space and domestic water heating. The major success of each is that a substantial portion of the heating load was provided by solar energy. The success of the NSDN program is that it indictes the approaches and parts of the systems that seem to work best, so that conclusions can be made about which applications are appropriate in varying circumstances. A brief report is presented for each system explaining the system, the energy flow through the system, the total cost, and the energy saved per year. DOE

N82-25653# Mid-American Solar Energy Complex, Minneapolis, Minn.
ANALYSIS OF THE SOLAR 80 PROGRAM IN FISCAL YEAR 1981
Sep. 1981 14 p
(Contract DE-AC02-79CS-30150)
(DE82-001190; MASEC-R-81-017) Avail: NTIS HC A02/MF A01

The Solar 80 Program is discussed in general. A review of existing solar houses is presented and the MASEC Solar 80 house design process is described. An evaluation of the Solar 80 program and products is also presented. DOE

N82-25654# Los Alamos Scientific Lab., N. Mex.
SOLAR ENERGY RESEARCH AT LOS ALAMOS Progress Report, 1 Oct. - 31 Dec. 1980
Sherry K. Reisfeld, comp. and Donald A. Neeper, comp. Sep. 1981 55 p
(Contract W-7405-eng-36)
(DE82-004222; LA-8984-PR) Avail: NTIS HC A04/MF A01

The performance of so-called sun-tempered buildings is under investigation. The thermal effects of water transpiration in the greenhouse of the Balcomb house are reported. The convective loop experiment shows that collector efficiency is nearly independent of the depth of the flow channels in the collector. Corrosion in liquid-cooled systems is being studied. Numerical modeling to investigate various methods for solar drying of sewage sludge, the existence of a boundary layer at the interface between the convecting and nonconvecting regions of a solar pond are discussed. Numerical analysis indicates that the convecting region will encroach upon the nonconvecting region when the temperature difference across the nonconvecting region exceeds a critical value. DOE

N82-25655# British Aerospace Dynamics Group, Bristol (England). Space and Communications Div.
SOLA: SOLAR ARRAY TECHNOLOGY DEVELOPMENT FOR SHUTTLE LAUNCHED MISSIONS Final Report
R. A. Henderson Paris ESA Mar. 1981 110 p refs
(Contract ESA-4148/79/NL-JS)
(ESS/SS-1039; ESA-CR(P)-1535) Avail: NTIS HC A06/MF A01

A 60 kW solar power array was designed. It features a multiple deployment/retraction capability and a multiple stowage/restowage capability. It allows for power growth and can provide a wide voltage range. Blanket construction is modular. It is compatible with orbiters, power module-type vehicles and the free flying pallet. It has remote manipulator system and extravehicular activity interfaces. Author (ESA)

N82-25656# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Raumfahrt.
PILOT SOLAR POWER PLANT [PILOTSOLARKRAFTANLAGE]
D. Wolf 1981 4 p Repr. from Erdoel u. Kohle - Erdgas - Petrochem. vereinigt mit Brennstoff-chem., v. 33, no. 8, Aug. 1980 p 343-344 In GERMAN
(MBB-UR-533-81-O) Avail: NTIS HC A02/MF A01

A fully functionally efficient solar-thermal power plant (10 kW electric) was built. The operating principle of thermomechanical conversion of solar energy into mechanical or electrical energy is presented. The equipment is completely automatic. Flat plate collectors absorb solar energy and convert it into heat which is transmitted by water to a heat exchanger. A closed cycle machine uses the heat to boil a working fluid (C2C12F4). A screw, powered by gas expansion in the working fluid, converts mechanical energy into electrical energy. Author (ESA)

N82-25657# Science Research Council, Chilton (England).
HEAT ENERGY RECOVERY FROM DOMESTIC OUTPUT FLUIDS (HERDOF)
F. M. Russell 1981 15 p refs
(PB82-134156; RL-81-074) Copyright. Avail: NTIS HC A02/MF A01 CSCL 10C

A device incorporating energy storage is described which permits recovery of part of the available heat energy in domestic output fluids. Preliminary estimates of the potential savings indicate the device should be examined in depth and practical tests conducted. The attitude of industry to the proposed device was considered and positive recommendations were made in that area. Author (GRA)

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N82-25658# Committee on Environment and Public Works (U.S. Senate).
AIR QUALITY MANAGEMENT IN SELECTED COUNTRIES
Maria H. Grimes Washington GPO 1981 71 p refs Presented to the Comm. on Environ. and Public Works, 97th Congr., 1st Sess., Nov. 1981 Prepared by the Library of Congr., Congr. Res. Serv.
(GPO-85-945) Avail: US Capitol, Senate Document Room

Air quality management in a number of countries is discussed. Emphasis is given to the economic impact of regulatory strategies on industry. The automobile industry and copper industry are discussed. The comparability of air pollution control standards in different countries is examined. R.J.F.

N82-25659# Committee on Science and Technology (U. S. House).
IMPACT OF AIR POLLUTANTS ON AGRICULTURE PRODUCTIVITY
Washington GPO 1981 152 p refs Joint hearing before the Subcomm. on Nat. Resources, Agr. Res. and Environ. of the Comm. on Sci. and Technol. and the Subcomm. on Dept. Operations, Res. and Foreign Agr. of the Comm. on Agr., 97th Congr., 1st Sess., No. 59, 9 Jul. 1981
(GPO-85-597) Avail: Subcommittee on Natural Resources, Agriculture Research and Environment

The economic and environmental impact of air pollution on agricultural productivity is discussed. The role of electric power plants in producing airborne pollutants is discussed. The destructive effects of acid rain, sulfur dioxide, and ozone are assessed. The roll of Federal regulations in the control of air pollution is discussed. R.J.F.

N82-25660*# Life Systems, Inc., Cleveland, Ohio.
DEVELOPMENT OF A STATIC FEED WATER ELECTROLYSIS SYSTEM
F. H. Schubert, J. B. Lantz, and T. M. Hallick Jan. 1982 78 p refs
(Contract NAS2-10306)
(NASA-CR-166142; NAS 1.26:166142; LSI-TR-404-4) Avail: NTIS HC A05/MF A01 CSCL 13B

A one person level oxygen generation subsystem was developed and production of the one person oxygen metabolic requirements, 0.82 kg, per day was demonstrated without the need for condenser/separators or electrolyte pumps. During 650 hours of shakedown, design verification, and endurance testing, cell voltages averaged 1.62 V at 206 mA/sq cm and at average operating temperature as low as 326 K, virtually corresponding to the state of the art performance previously established for single cells. This high efficiency and low waste heat generation prevented maintenance of the 339 K design temperature without supplemental heating. Improved water electrolysis cell frames were designed, new injection molds were fabricated, and a series of frames was molded. A modified three fluid pressure controller was developed and a static feed water electrolysis that requires no electrolyte in the static feed compartment was developed and successfully evaluated. Author

N82-25661*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
IN SITU OZONE DATA FOR COMPARISON WITH LASER ABSORPTION REMOTE SENSOR: 1980 PEPE/NEROS PROGRAM
David S. McDougal, Robert B. Lee, III, and Richard J. Bendura May 1982 42 p refs
(NASA-TM-84471; NAS 1.15:84471) Avail: NTIS HC A03/MF A01 CSCL 13B

Several sets of in situ ozone (O3) measurements were made by a NASA aircraft in support of the laser absorption spectrometer (LAS) remote sensor. These measurements were designed to provide comparative O3 data for the LAS sensor. The LAS, which was flown on a second aircraft, remotely measured the vertical burden of O3 from the aircraft to the surface. In situ results of the air quality (O3 and B sub scat) and meteorological (temperature and dewpoint) parameters for three correlative missions are presented. The aircraft flight plans, in situ concentration profiles and vertical burdens, and measurement errors are summarized. B.W.

N82-25662# Corps of Engineers, Buffalo, N.Y.
US LAKE ERIE NATURAL GAS RESOURCE DEVELOPMENT. PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT Final Report
Arthur K. Marks, Paul J. Horvatin, P. G. Leuchner, and V. Saulys Mar. 1982 240 p refs Prepared in cooperation with EPA, Chicago
(AD-A112074) Avail: NTIS HC A11/MF A01 CSCL 13/2

This report comprises an abbreviated statement which incorporates by reference the Draft Programmatic statement of the same title dated November 1980 for detailed information. The document summarizes the environmental impacts associated with development of natural gas beneath U.S. waters of Lake Erie's eastern and central basins bordering the States of New York, Pennsylvania, and Ohio; provides errata and addenda to the Draft statement; and responds to comments received on the Draft Statement. Major topics of discussion include: applicability of using the Canadian Lake Erie drilling experience; establishment of a Task Force and in each state an offshore office for program coordination; waste disposal methodology; need for natural gas; the role of the International Joint Commission, the 1909 U.S. - Canada Boundary Waters Treaty, and the 1978 Water Quality Agreement; the effects of resuspending sediment; validity of using worst-case accident analysis in lieu of Canadian accident data; contingency plans and spill cleanups; the effects of polyethylene glycol chlorination; impacts on water supplies and water treatment costs; an onland alternative program; and an explanation of the reference program concept. GRA

N82-25663# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Lab.
EVALUATION OF MARSH/ESTUARINE WATER QUALITY AND ECOLOGICAL MODELS. AN INTERIM GUIDE Final Report
Ross W. Hall, Jr. Jan. 1982 28 p refs
(AD-A111298; WES/MP/EL-82-1) Avail: NTIS HC A03/MF A01 CSCL 08/8

This report presents water quality and ecological problems in coastal marshes and estuaries, suggests applicable modeling approaches to problem solution, and provides the basis for the modeling recommendations through a brief summary of water quality and ecological modeling in the marsh/estuarine environment. Author (GRA)

N82-25664# Los Alamos Scientific Lab., N. Mex.
SCREENING METHODOLOGY FOR CALCULATING WORST-

CASE CONCENTRATIONS DOWNWIND FROM A LARGE, ISOLATED, AIR-POLLUTANT-EMISSION SOURCE
David Nochumson Sep. 1981 28 p refs
(Contract W-7405-eng-36)
(DE82-002286; LA-8871-MS) Avail: NTIS HC A03/MF A01

A screening methodology to indicate whether a proposed source to be sited in a flat or high-terrain situation has the potential to violate ambient air quality standards was developed. The Gaussian plume formulation serves as a basic element of the methodology, which follows the guidelines recommended by the US Environmental Protection Agency for evaluating the air quality impacts of new stationary sources. A step-by-step procedure is given to calculate maximum ground-level concentration of pollutants under a variety of worst-case conditions that depend upon terrain conditions and the controlling air quality standards. The methodology is applied to a case study that examines the siting of generic coal-fired power plants in the West and the constraints imposed by terrain and sulfur dioxide air quality standards. DOE

N82-25665# Los Alamos Scientific Lab., N. Mex.
ENVIRONMENTAL AND RADIOI OGICAL SAFETY STUDIES. INTERACTION OF (238)PuO2 HEAT SOURCES WITH TERRESTRIAL AND AQUATIC ENVIRONMENTS Progress Report, 1 Apr. - 30 Jun. 1981
George M. Matlack and James H. Patterson Sep. 1981 6 p
(Contract W-7405-eng-36)
(DE82-002439; LA-8996-PR) Avail: NTIS HC A02/MF A01

The containers for (238)PuO2 heat sources in radioisotope thermoelectric generators were tested. Studies of the effects on the heat source of terrestrial and aquatic environments to obtain data for design of even safer systems are described. Data from environmental chamber experiments that simulate terrestrial conditions, experiments to measure PuO2 dissolution rates, soil column experiments to measure sorption of plutonium by soils, and several aquatic experiments are described. DOE

N82-25666# Los Alamos Scientific Lab., N. Mex.
CALCULATIONS OF SOLAR IRRADIANCES IN CLEAR AND POLLUTED ATMOSPHERES AND POTENTIAL EFFECTS ON PLANT LIFE
Andrew Zardecki and Siegfried A. W. Gerstl Oct. 1981 60 p refs
(Contract W-7405-eng-36)
(DE82-002941; LA-9010-MS) Avail: NTIS HC A04/MF A01

Computational methods initially developed for neutron transport analysis, are applied to perform accurate radiative transfer calculations for clear and aerosol-loaded atmospheres. The discrete ordinates ONETRAN code is used to calculate the downward global fluxes for 42 wavelength groups between 0.28 and 0.70 microns. The reduction of the two angle geometry transport equation to standard plane geometry is discussed, and the theory of the adjoint linear Boltzmann equation is summarized. After validating the method against both published results and photometric measurements, realistic atmospheric models with rural, urban, maritime, or tropospheric aerosols in the boundary layer are considered. As the aerosol concentration increases there is a considerable reduction of the photosynthetically active radiation that reaches ground level. Finally, potential applications of the methods to the infrared part of the spectrum are briefly discussed. DOE

N82-25667# Los Alamos Scientific Lab., N. Mex.
QUALITY ASSURANCE FOR ENVIRONMENTAL ANALYTICAL CHEMISTRY, 1980
Ernest S. Gladney, William E. Goode, Danial R. Perrin, and Colleen E. Burns Sep. 1981 177 p refs
(Contract W-7405-eng-36)
(DE82-002992; LA-8966-MS) Avail: NTIS HC A09/MF A01

The continuing quality assurance effort by the Environmental Surveillance Group is presented. Included are all standard materials now in use, their consensus or certified concentrations, quality control charts, and all quality assurance measurements made by H-8 during 1980. DOE

N82-25668# Stockholm Univ. (Sweden). Dept. of Meteorology.
CHLORIDE (CI) IN PRECIPITATION: A PRESENTATION FROM THE EUROPEAN AIR CHEMISTRY NETWORK
Rolf Soederlung and Lenhart Granat Feb. 1982 74 p refs
(Contracts SWED-EPB-641-3082-81-Fp; SWED-EPB-3511-80-FP; Grants NFR-G-GU-3922 -103; NFR-G-Ur-0223-110)
(CM-56) Avail: NTIS HC A04/MF A01

The chloride content of monthly precipitation samples was analyzed for the period 1955 to 1979. Using the median two-way table statistical analysis, a seasonal variation of concentration with high concentration in November through February and low concentration in June through August is found. No long-term change (trend) in concentration is observed. Author (ESA)

N82-25669# Environmental Protection Agency, Ann Arbor, Mich. Control Technology Assessment and Characterization Branch.
NITROSAMINES AND OTHER HAZARDOUS EMISSIONS FROM ENGINE CRANKCASES
Thomas M. Baines Jun. 1981 15 p refs
(PB82-127960; EPA-AA-CTAB-PA-81-15) Avail: NTIS HC A02/MF A01 CSCL 13B

The emissions from heavy duty Diesel crankcases which contain a number of hazardous compounds were studied. Research discovered some of them and it may be possible that there are some that have not yet been quantified. Nitrosamines (a potent carcinogen in animals and probably also in humans) are emitted from engines using fresh oil. These emissions seem to be a function of the type of oil used and some engine parameters such as crankcase flow rate of NOx compounds. Used lubricating oil was shown to contain carcinogenic compounds such as benzo-a-pyrene. It was also shown to be mutagenic. Therefore it can be concluded that the particulate portion of the crankcase effluent stream may start out after an oil change at a level containing few carcinogenic compounds but the level of these compounds increases with time. GRA

N82-25670# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
QUESTIONS AND RESPONSES AT THE 1981 WORKSHOPS ON PROCEDURES TO DEMONSTRATE ATTAINMENT OF THE NAAQS (NATIONAL AMBIENT AIR QUALITY STANDARDS) FOR OZONE IN THE 1982 SIPS (STATE IMPLEMENTATION PLANS) Final Report
Edwin L. Meyer, Gerald L. Gipson, and Robert F. Kelly Sep. 1981 44 p
(PB82-107863; EPA-450/4-81-030) Avail: NTIS HC A03/MF A01 CSCL 13B

Responses to questions asked at workshops describing the basis and application of city-specific EKMA are presented. Subject matter discussed includes the conceptual basis for EKMA, implications of the statistical form of the ozone NAAQS, monitoring support needed for EKMA analyses, generation and application of ozone isopleth diagrams, and results of efforts to validate EKMA. GRA

N82-25772# Joint Publications Research Service, Arlington, Va.
AEROSOL POLLUTION OF AIRTIGHT HABITATS
B. V. Anisimov, T. I. Golubeva, G. N. Kuzmenko, and V. P. Savina *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 108-112 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 73-76 (For primary document see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N82-25671*# Washington Univ., St. Louis, Mo. Dept. of Earth and Planetary Sciences.
STRUCTURE OF THE MIDCONTINENT BASEMENT.

TOPOGRAPHY, GRAVITY, SEISMIC, AND REMOTE SENSING

Edward A. Guinness, John W. Strebeck, Raymond E. Arvidson, Klaus Scholz, and Geoffrey F. Davies 1 Nov. 1981 27 p refs Sumbitted for publication

(Contracts NAS5-26533; JPL-955959)

(NASA-CR-166808; NAS 1.26:166808) Avail: NTIS HC A03/MF A01 CSCL 08G

Some 600,000 discrete Bouguer gravity estimates of the continental United States were spatially filtered to produce a continuous tone image. The filtered data were also digitally painted in color coded form onto a shaded relief map. The resultant image is a colored shaded relief map where the hue and saturation of a given image element is controlled by the value of the Bouguer anomaly. Major structural features (e.g., midcontinent gravity high) are readily discernible in these data, as are a number of subtle and previously unrecognized features. A linear gravity low that is approximately 120 to 150 km wide extends from southeastern Nebraska, at a break in the midcontinent gravity high, through the Ozark Plateau, and across the Mississippi embayment. The low is also aligned with the Lewis and Clark lineament (Montana to Washington), forming a linear feature of approximately 2800 km in length. In southeastern Missouri the gravity low has an amplitude of 30 milligals, a value that is too high to be explained by simple valley fill by sedimentary rocks.

B.W.

N82-25672# Council for Scientific and Industrial Research, Pretoria (South Africa).

ON THE FORMATION AND DEVELOPMENT IN TIME OF STABLE LAYERS IN THE LOWER ATMOSPHERE. EXPERIMENTAL VERIFICATION OF MATHEMATICAL MODELS FOR FORECASTING THE THICKNESS OF MIXED LAYERS IN THE LOWER ATMOSPHERE AS A FUNCTION OF TIME

A. Piano, D. Anfossi, P. Bacci, C. Giraud, and A. Longhetto 1981 14 p refs Transl. into ENGLISH of Conf. paper of the Soc. Hydrotech. de France 14th Congr. on Hydraulics, Lab. di Cosmo-Geofisica del CNR, Torino (Italy), 1976 Conf. held in Paris, 1976

(CSIR-Trans-1604) Avail: NTIS HC A02/MF A01

Several measurement campaigns carried out in the course of the last few years in the Po River plain, using a Lidar and a kite balloon resulted in the establishment of a relationship between the thickness of the stable layers and the time elapsed since sunset. This made it possible to develop a forecasting model giving the vertical temperature distribution from sunset to dawn. In particular, this model makes it possible to forecast dawn temperature distributions; this in turn made it possible to check models for the development of mixed convective layers. Carson's model proved to correspond most closely to the experimental data, even at a coastal site where the erosion of the stable layer before a sea breeze arises was studied. Author

N82-25673*# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.

INITIAL STUDIES OF MIDDLE AND UPPER TROPOSPHERIC STRATIFORM CLOUDS Final Technical Report

Stephen K. Cox 18 May 1982 484 p refs

(Grant NsG-5357)

(NASA-CR-168971; NAS 1.26:168971) Avail: NTIS HC A21/MF A01 CSCL 04A

The spatial and temporal occurrence of cloud layers, the development of a physical-numerical model to simulate the life cycles of tropospheric cloud layers, and the design of an observational program to study the properties of these layers are described. For individual titles, see N82-25674 through N82-25677.

N82-25674*# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.

CHARACTERISTICS OF MIDDLE AND UPPER TROPOSPHERIC CLOUDS AS DEDUCED FROM RAWINSONDE DATA Final Technical Report

David D. O. Starr and Stephen K. Cox *In its* Initial Studies of Middle and Upper Tropospheric Stratiform Clouds 18 May 1982 78 p refs (For primary document see N82-25673 16-46)

(CSU-ATS-327; ISSN-0067-0340) Avail: NTIS HC A21/MF A01 CSCL 04A

The static environment of middle and upper tropospheric clouds is characterized. Computed relative humidity with respect to ice is used to diagnose the presence of cloud layer. The deduced seasonal mean cloud cover estimates based on this technique are shown to be reasonable. The cases are stratified by season and pressure thickness, and the dry static stability, vertical wind speed shear, and Richardson number are computed for three layers for each case. Mean values for each parameter are presented for each stratification and layer. The relative frequency of occurrence of various structures is presented for each stratification. The observed values of each parameter and the observed structure of each parameter are quite variable. Structures corresponding to any of a number of different conceptual models may be found. Moist adiabatic conditions are not commonly observed and the stratification based on thickness yields substantially different results for each group.

J.D.

N82-25675*# Colorado State Univ., Fort Collins.

A MIDDLE AND UPPER TROPOSPHERIC CLOUD MODEL Final Technical Report

In its Initial Studies of Middle and Upper Tropospheric Stratiform Clouds 18 May 1982 189 p refs (For primary document see N82-25673 16-46)

Avail: NTIS HC A21/MF A01 CSCL 04A

The interplay of the various physical processes involved in the formation, maintenance, and decay of middle and upper tropospheric stratiform clouds is discussed. Ice phase fair weather cloud forms are considered. Simulations of cirriform clouds which attempt to incorporate the physical processes in an interactive manner were performed. A two dimensional time dependent Eulerian numerical model, which incorporates all of the important physical processes in a simplified way, is employed to investigate the role of these processes in the evolution of a cloud in an isolated atmospheric layer. Physical parameters considered are the eddy viscosity and the thermal, water vapor, and ice water eddy diffusivities.

J.D.

N82-25676*# Colorado State Univ., Fort Collins.

A PROPOSAL FOR OBSERVATIONS OF UPPER AND MIDDLE TROPOSPHERIC CLOUDS Final Report

In its Initial Studies of Middle and Upper Tropospheric Stratiform Clouds 18 May 1982 56 p refs (For primary document see N82-25673 16-46)

Avail: NTIS HC A21/MF A01 CSCL 04A

A proposal for a multi-institutional investigation of the processes involved in the growth and maintenance of high level extended clouds is presented. Mapping of variability of the cloud and of its radiative characteristics in terms of the meteorological environment of the cloud; performance of case studies involving observation of the cloud microphysics and radiation characteristics; and investigation of the processes responsible for the generation, maintenance, and dissipation of the cloud system are recommended. Both modeling and monitoring activities are considered. The specific research projects which the author proposes to carry out are described. Suggestions for the administrative organization of the total effort are presented.

J.D.

N82-25677*# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.

A CLIMATE INDEX DERIVED FROM SATELLITE MEASURED SPECTRAL INFRARED RADIATION Ph.D. Thesis

Michael D. Abel and Stephen K. Fox *In its* Initial Studies of Middle and Upper Tropospheric Stratiform Clouds 18 May 1982 157 p refs (For primary document see N82-25673 16-46)

(CSU-ATS-335; ISSN-0067-0340) Avail: NTIS HC A21/MF A01 CSCL 04A

The vertical infrared radiative emitting structure (VIRES) climate index, based on radiative transfer theory and derived from the spectral radiances typically used to retrieve temperature profiles, is introduced. It is assumed that clouds and climate are closely related and a change in one will result in a change in the other. The index is a function of the cloud, temperature, and moisture distributions. It is more accurately retrieved from satellite data than is cloudiness per se. The VIRES index is based upon the shape and relative magnitude of the broadband weighting function of the infrared radiative transfer equation. The broadband weighting curves are retrieved from simulated

satellite infrared sounder data (spectral radiances). The retrieval procedure is described and the error sensitivities of the method investigated. Index measuring options and possible applications of the VIRES index are proposed. J.D.

N82-25678*# Utah State Univ., Logan. Center for Atmospheric and Space Sciences.

A STUDY OF ATMOSPHERE-IONOSPHERE-MAGNETOSPHERE COUPLING Final Report

W. J. Raitt and J. L. Paris May 1982 36 p refs

(Grant NAG5-121)

(NASA-CR-168972; NAS 1.26:168972) Avail: NTIS HC A03/MF A01 CSCL 04A

The properties of low energy plasma in the magnetosphere were predicted. The effects of wave particle interactions involving the concept of plasmons are studied, and quantum mechanical formulations are used for the processes occurring and bulk energization of the low energy plasma are investigated through the concept of the energy momentum tensor for the plasma and its electromagnetic environment. S.L.

N82-25679*# Texas Univ., El Paso. Dept. of Geological Sciences.

OCCURRENCE AND MINERAL CHEMISTRY OF HIGH PRESSURE PHASES, POTRILLO BASALT, SOUTHCENTRAL NEW MEXICO M.S. Thesis Final Technical Report, 1 Jun. 1980 - 31 May 1982

Tatum Michael Sheffield 31 May 1982 100 p refs

(Grant NsG-9062)

(NASA-CR-169008; NAS 1.26:169008) Avail: NTIS HC A05/MF A01 CSCL 08G

The presence of an older plagioclase-rich basalt and a younger olivine-rich basalt were confirmed by modal and chemical analysis. Chemical analysis also confirmed the presence of flows that are tholeiitic in composition and could be remnants of an original tholeittic parent magma. Eruptions from different levels of a differentiated magma chamber are proposed to account for the two members. Author

N82-25680# Wuppertal Univ. (West Germany). Dept. of Physics.

SOUNDING ROCKET PROGRAM AERONOMY PROJECT: ENERGY BUDGET CAMPAIGN 1980. EXPERIMENT SUMMARY Final Report

Dirk Offermann and Eivind V. Thrane Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 424 p refs Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-W-81-052; ISSN-0170-1339) Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

Ground based, rocket, and balloon-borne experiments investigating auroral activity, atmospheric composition, and winds in the mesosphere and thermosphere are discussed. For individual titles, see N82-25681 through N82-25711.

N82-25681*# Wuppertal Univ. (West Germany).

SCIENTIFIC OBJECTIVES AND EXPERIMENTAL SETUP OF THE ENERGY BUDGET CAMPAIGN Final Report

D. Offermann *In its* Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 11-45 refs Sponsored by NASA, Bundesministerium fuer Forschung und Technologie, Bonn, Ministerium fuer Wissenschaft und Forschung, Norwegian Defense Research Estab. Royal Norwegian Council for Scientific and Industrial Research, SRC, London, Acad. of Sciences, US Air Force (For primary document see N82-25680 16-46)

Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90 CSCL 04A

Ground based, rocket-borne, and balloon investigations of energetic processes in the mesosphere and lower thermosphere during magnetic disturbances are summarized. Energy input and output processes were measured during Joule heating, particle precipitation, and quiet polar night conditions. Data indicate unexpectedly low geomagnetic activity. Stratospheric temperatures (10 mbar) reveal no stratospheric warming, and an extremely cold middle stratosphere. Adverse weather conditions interfered with experiments such as measurement of auroral activity, but data collecting objectives were met. Author (ESA)

N82-25682# Muenster Univ. (West Germany). Inst. fuer Geophysik.

A SIMPLE METHOD FOR CALCULATING LATITUDINALLY INTEGRATED JOULE HEATING RATES DURING THE ENERGY BUDGET CAMPAIGN Final Report

W. Baumjohann *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 46-56 refs (For primary document see N82-25680 16-46)

Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

A method for estimating the temporal development of Joule heating rates, integrated over the width of an auroral oval, is presented. The method is based on magnetic observations from a meridional chain of four geomagnetic observatories and latitudinally averaged values of the north-south field components obtained from radar measurements of auroral backscatter. Meridional heating profiles (constructed by cubic spline interpolation) of the variations recorded by the observatories are integrated. The integrals are multiplied by averaged electric field components for 68 deg to 72 deg N. The method works only when auroral Hall currents flow purely westward or purely eastward. Author (ESA)

N82-25683# Laboratoire de Sondages Electromagnetiques de l'Environment Terrestre, Toulon (France).

SWEDISH AND FRENCH AURORAL INVESTIGATION (SAFARI) EXPERIMENTS DURING THE ENERGY BUDGET CAMPAIGN Final Report

C. Hanuise, M. Crochet, J. P. Villain, A. Hedberg (Uppsala Ionospheric Obs., Sweden), and G. Hamberg (Uppsala Ionospheric Obs., Sweden) *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 57-64 refs Sponsored in cooperation with Inst. National d'Astronomie et de Geophysique, Univ. de Toulon et du Var and Swedish Natural Science Research Council (For primary document see N82-25680 16-46)

Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

Multifrequency HF coherent radar investigations of plasma instabilities and electric field measurement in the auroral ionosphere are described. The E layer electric field is derived from the mean phase velocity of Doppler spectra, which is related to electron velocity through a dispersion equation. Radial phase velocity variation data for 19 Nov 1980 from 03:05 to 03:35 UT, plotted as a function of time, reveal weak amplitude throughout. They disappear from 03:09 to 03:13 UT. Radial velocity is between 100 and 200 m/sec, with maximum = 400 m/sec. Author (ESA)

N82-25684# Tromsoe University (Norway). Inst. of Mathematical and Physical Sciences.

PARTIAL REFLECTION RADAR DATA OBTAINED AT RAMFJORDMOEN DURING THE ENERGY BUDGET CAMPAIGN

A. Brekke, T. Hansen, and O. Holt *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 65-80 refs Sponsored by Royal Norwegian Council for Scientific and Industrial Research (For primary document see N82-25680 16-46)

Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

Amplitude profiles of radio signals reflected from the auroral D region, and electron density profiles derived from them are presented. Ionospheric conditions following rocket launches are discussed. Maxima in amplitude profiles occur at heights between 76 and 92 km. Below 76 km, only noise is present. Autocorrelation functions of X-mode signals reveal a fairly strong and stable contribution of fluctuations with periods < 10 sec. Long periodic fluctuations are more variable, but are relatively strong at 90 km during the first part of events. Autocorrelation functions for O-mode at altitudes corresponding to maxima in the ordinary amplitude profile indicate that strong turbulence and strong waves are present. Author (ESA)

N82-25685# Graz Univ. (Austria). Inst. fuer Meteorologie und Geophysik.
TOTAL ELECTRON CONTENT IN THE POLAR REGION Final Report
R. Leitinger, E. Putz, G. Hartmann (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany), W. Degenhardt (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany), A. Hedberg (Uppsala Ionospheric Obs., Sweden), and A. Ranta (Geophysical Obs., Sodankylae, Finland) *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 81-94 refs Sponsored in part by Oesterreichischer Fonds zur Foerderung der Wissenschaftlichen Forschung (For primary document see N82-25680 16-46)
Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

Electron content (N) data calculated by the two stations evaluation method and derived from Sirio satellite data are presented. Several times, two different types of strong N enhancements are observed. One type shows the enhancement over a large latitude range north of L = 4, the other shows the enhancement in a very confined latitude region around L = 4. Author (ESA)

N82-25686# Geophysical Observatory, Sodankyla (Finland).
VARIATION OF IONOSPHERIC ABSORPTION MEASURED BY FINNISH NORTH TO SOUTH RIOMETER CHAIN Final Report
Hilkka Ranta and Aarne Ranta *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 95-115 refs (For primary document see N82-25680 16-46)
Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

Mean diurnal variations of auroral absorption measured at nine stations lying between 6.0 and 3.3 L are presented. The riometers operate at 30 and 27.6 MHz; one station also measures at 40 and 50 MHz and at 27.6 MHz with a narrow beam antenna. Variations observed on the nights of balloon and rocket launches are also reported. Author (ESA)

N82-25687# Kiruna Geophysical Inst. (Sweden).
AURORAL EMISSION AND COSMIC NOISE ABSORPTION MEASUREMENTS DURING THE ENERGY BUDGET CAMPAIGN Final Report
Georg Gustafsson and Aake Steen *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 116-123 refs (For primary document see N82-25680 16-46)
Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

Data from a combined photometer-riometer for a night when Salvo C rockets were launched are presented. One photometer channel at 427.8 nm and the riometer absorption were analyzed, showing the precipitation of particles over a range of 100 km from Kiruna, Sweden. Two separate relatively weak events with similar characteristics are reported. They begin with a soft spectrum (with very little absorption), which in the morning event is much more pronounced in the north. After the maximum of the event, the ratio between the emission and the absorption is constant. During the recovery phase the ratio changes to another, but still constant, value. Absorption is high compared with emission, corresponding to a dominant high energy particle population. Author (ESA)

N82-25688# Finnish Meteorological Inst., Helsinki. Div. of Geomagnetism.
TECHNIQUES AND RESULTS OF THE JOINT FINNISH-SWEDISH OPTICAL NETWORK DURING THE ENERGY BUDGET CAMPAIGN IN NOVEMBER 1980 Final Report
R. Pellinen, K. Kaila, L. Bjoern (Uppsala Ionospheric Obs., Sweden), H. Opgenooth (Uppsala Ionospheric Obs., Sweden), G. Gustafsson (Kiruna Geophysical Inst., Sweden), and A. Steen (Kiruna Geophysical Inst., Sweden) *In* Wuppental Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 124-135 refs (For primary document see N82-25680 16-46)
Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

Five all sky cameras four multichannel photometers and one high sensitivity TV camera with videorecorder operated at five different sites in Northern Finland and Sweden during the campaign. Successful optical recordings were made during every rocket and balloon launch at least at one site, and in many cases at several stations. Instruments and data handling techniques are described. When auroras appear at 120 km altitude, approximate electron energy is 5 keV. For the aurora to descend to 105 km, 10 keV is needed. Total particle input can be estimated from variations in auroral altitudes and the spatial extent of auroral luminosity. Author (ESA)

N82-25689# Utah State Univ., Logan.
GROUND BASED MEASUREMENTS OF TIME RESOLVED NEAR IR SPECTRA AND TEMPERATURE Final Report
D. J. Baker, A. J. Steed, G. A. Ware, B. Y. Bartschi, and A. T. Stair, Jr. (Air Force Geophys. Lab., Hanscom AFB, Mass.) *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 136-146 refs (For primary document see N82-25680 16-46)
Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

Interferometer/spectrometer and coaligned photometer/radiometer data collected at the time of rocket salvoes B and C are discussed. Spectra including airglow bands of OH and molecular O, auroral bands of both neutral and ionized molecular N, and auroral atomic N and O lines were obtained. Continuous absolute measurements of the emission bands of N2, O2, and OH were also obtained. Rotational temperatures were computed from the observed OH band structure. The instrumentation and operation of the ground station are described. A summary evaluation of the data gathered is presented. Author (ESA)

N82-25690# Wuppertal Univ. (West Germany).
A GROUND BASED NEAR INFRARED SPECTROMETER/PHOTOMETER FOR NIGHTGLOW EMISSIONS OF OH AND O2 (1DELTA G) Final Report
G. Lange, R. Gerndt, H. Trinks, and D. Offermann *In its* Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 147-160 refs (For primary document see N82-25680 16-46)
Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

A spatially scanning photometer and a spectrometer operated during the energy budget campaign 1980 at Kiruna, Sweden are described, and absolute ground level radiances obtained by the photometer are presented. The 0.5 m spectrometer grating is ruled with 830 l-ell/mm and is blazed for 1.2 microns in first order. With a 1.5 mm slit width, 32 A spectral resolution is obtained. Scanning time for a complete spectrum is from 30 to 60 min. In normal operation scanning is limited to a narrow interval around 1.53 microns in order to record the P-branch lines of the OH transition. The photometer has a 5.2 deg field of view, 1.27 and 1.314 micron filters, an integration time constant of 0.4 sec, and scan for both channels is completed in 2 to 4 min. Mean night temperature of the OH layer around 85 km computed from the spectra of the OH vibrational rotational band as recorded by the spectrometer is 224 K. Author (ESA)

N82-25691# Sheffield Univ. (England). Dept. of Physics.
CO-ORDINATED METEOR WIND RADAR OBSERVATIONS DURING THE ENERGY BUDGET CAMPAIGN FROM TWO LOCATIONS IN THE BRITISH ISLES Final Report
H. G. Muller and S. P. Kingsley *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 170-183 refs Sponsored by SRC and the Meteorological Office's Gassiot Grants Committee (For primary document see N82-25680 16-46)
Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

Upper mesopause winds were recorded in Nov. and Dec. 1980, using radar systems in Sheffield (53 deg N) and Stornoway (58 deg N). Average wind values are produced every 30 min for NW and SW directed transmitters, and for the 75 to 90, 90 to 96, and 96 to 115 km height intervals. An all height average (mean = 95 km) is produced. Data show marked tidal wave activity at both sites, but the presence of planetary waves

of quasi two-day period is less prominent than during a summer 1980 run. Author (ESA)

N82-25692# Consiglio Nazionale delle Ricerche, Bologna (Italy). Lab. FISBAT.

METEOR RADAR WIND OBSERVATIONS DURING THE ENERGY BUDGET CAMPAIGN 1980 Final Report

G. Cevolani and A. Dardi *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 184-206 refs (For primary document see N82-25680 16-46)

Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

Equipment and data processing at a meteor radar station near Bologna are described, and results of zonal wind observations for 7-30 Nov. 1980 are presented. Measurements were made between 75 and 115 km altitude. Monthly wind means disagree with those established during Nov 1976 and 1978 observations, and with the Cospar 1972 model for 45 deg N seasonal variations. Gravity waves contribute significantly to the energy budgets of the mesosphere and lower thermosphere. Results indicate considerable day to day variations in tidal phase and amplitude. This suggests interference between tidal modes and changes in the source regions. Wind time series analysis reveals oscillations around 2 to 3, 5 to 6, and 10 days in the ionosphere.

Author (ESA)

N82-25693# Graz Univ. (Austria). Dept. of Communications and Wave Propagation.

BALLOON-BORNE MEASUREMENTS OF AURORALLY GENERATED X-RAYS, ELECTRIC FIELDS AND INFRASONIC WAVES Final Report

H. Slamanig and M. Friedrich *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 207-220 refs (For primary document see N82-25680 16-46)

Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

The block diagram of an integrated ballon payload for measuring X-rays, electric fields and rapid temperature variations is presented. Bremsstrahlung X-rays are measured by an uncollimated scintillation counter whose crystal is optically connected to a photomultiplier. Almost 100% efficiency up to 200 keV is achieved. The electric field probes are 20 cm dia aluminum spheres mounted on four booms. Horizontal field is derived from the voltage difference between the upper pair; orthogonal field is calculated from the lower pair. Temperatures are derived by measuring the phase of a continously radiating acoustic transmitter, using two microphones placed 30 and 120 cm from it. A photometer with a spectral response peak at 400 + or - 20 nm detects optical auroras. An electronic card determines pressure, payload temperature, battery voltage and balloon location. A slow PCM telemetry system is used.

Author (ESA)

N82-25694# Max-Planck-Institut fuer Kernphysik, Heidelberg (West Germany).

MASS SPECTROMETRIC MEASUREMENTS IN THE D AND E REGION AT ANDOYA, DURING THE ENERGY BUDGET CAMPAIGN Final Report

D. Krankowsky, H. Boy, P. Laemmerzahl, and W. Joos *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 221-232 refs (For primary document see N82-25680 16-46)

Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

Three mass spectrometers were flown during geomagnetically quiet and disturbed conditions. Data on the composition of positive and negative ions and neutral gases were collected at 66 to 150 km altitude. In the E region, ion density is 100 billion ions per cum for all flights. In the D region during disturbed nights, densities are higher by up to a factor of 30. The NO/02 ion density ratios are between one and seven throughout the altitude range for two nights (one disturbed), but are larger over 90 km for the other disturbed night. The NO densities are lowest during undisturbed conditions and markedly high on disturbed nights. Altitude distribution and density of NO are controlled by horizontal and vertical transport as well as by local production from energetic particle ionization.

Author (ESA)

N82-25695# Norwegian Defence Research Establishment, Kjeller.

AN EXPERIMENT DESIGNED TO MEASURE FINE SCALE STRUCTURE IN THE MESOSPHERE AND LOWER THERMOSPHERE Final Report

B. Grandal, R. Christensen, E. V. Thrane, and A. Soereide (Christian Michelsen Inst.) *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 233-243 refs (For primary document see N82-25680 16-46)

Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

A rocket-borne experiment for investigating the irregular structure in the lower ionosphere at three different points in space simultaneously is described. Spherical gridded electrostatic probes measure positive ion current with high time resolution and accuracy. In each of three salvoes during the energy budget campaign, two rockets were launched within 12 sec from the same site. One carried two probes that separated from the main payload during flight, the other had one probe fixed to the front end of the payload. Results reveal a patch of irregularities in ion current, possibly caused by turbulence. Author (ESA)

N82-25696# Graz Univ. (Austria). Dept. of Communications and Wave Propagation.

REFINEMENTS IN THE DERIVATION OF D REGION PLASMA DENSITIES BASED ON THE ROCKET-BORNE FARADAY EXPERIMENT Final Report

K. M. Torkar and M. Friedrich *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Nov. 1981 p 244-255 refs (For primary document see N82-25680 16-46)

Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

The principles of the Faraday experiment and an electrostatic probe are outlined. The data processing procedure needed to correct for payload attitude is described. Measurement is based on the doubly refractive properties of magnetoplasmas towards electromagnetic waves. Waves emitted by linearly polarized aerials of HF transmitters are considered as the superposition of two circularly polarized waves rotating in opposite directions. After traversing a magnetoplasma the composite signal is an ellipse. Its major axis equals the sum and its minor axis the difference of the wave components. Its major axis is rotated with respect to the original polarization due to different arrival times, i.e. Faraday rotation. Electron density and collision frequency are derived from the position and shape of the ellipse in space. In the experiment an electric dipole pair spinning with the rocket payload scans the polarization pattern. Electron density and collision frequency are derived from trial profiles which are used to simulate the raw data. Raw data are then compared with measured values which are weighted according to their goodness of fit, a voltage equation, and the derivative with respect to electron density and collision frequency. Author (ESA)

N82-25697# Wuppertal Univ. (West Germany).

A LIQUID HELIUM COOLED TWIN GRATING SPECTROMETER FOR MEASUREMENTS OF UPPER ATMOSPHERE INFRARED EMISSIONS Final Report

K. U. Grossmann, W. G. Frings, R. Hennig, and D. Offermann *In its* Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 256-274 refs Sponsored by Bundesministerium fuer Forschung und Technologie (For primary document see N82-25680 16-46)

Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

An infrared grating spectrometer for analyzing mesospheric and thermospheric infrared emission at wavelengths from 2.5 to 17, and 55 to 95 microns was launched on 16 Nov 1980 at 03:13 UT from Esrange, Sweden, as part of the energy budget campaign. Preliminary data about the atmospheric 15 micron band emission of carbon dioxide are presented. The far IR emission of the water vapor rotational transitions was measured at two fixed wavelengths. From these intensities an H2O volume mixing ratio close to 1 ppm above 65 km is obtained. Author (ESA)

N82-25698# Fraunhofer Inst., Freiburg (West Germany).
THE AURORAL SPECTROMETER/PHOTOMETER EXPERIMENT EF 11 Final Report
G. Schmidtke, G. Stasek, M. Knothe, and P. Seidl *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 275-281 refs (For primary document see N82-25680 16-46)
Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

A combination of grating spectrometers and photometers with 18 detectors was successfully flown within the energy budget campaign rocket program. In order to determine photon fluxes as generated by precipitating particles, the experiment completely covered the spectral region from 50 to 650 nm with wavelength ranges overlapping. The spectral resolution for the instruments scanning from 50 to 250 nm is 1 nm, for the other instrument (105 to 650 nm) it is 3 nm. Up to 15 spectra were recorded in each of the wavelength channels for height regions above 100 km. Monochromators at 83.4, 98.9, 120, 168.8 and 215 nm and photometers at 130.4, 337.1, 391.4 and 557.7 nm sensed selected auroral emissions from ionized and neutral atomic oxygen and molecular nitrogen. Height emission profiles for oxygen exhibit resonance diffusion up to peak height (250 km). Manifold spectral recordings for 175 km show a strong relative decrease in N2 Lyman-Birge-Hopfield band emission compared with 113 km.
Author (ESA)

N82-25699# Fraunhofer Inst., Freiburg (West Germany).
MEASUREMENT OF THE ELECTRIC FIELD IN VIEW OF THE ENERGY BUDGET IN THE POLAR HIGH ATMOSPHERE Final Report
H. Wolf and R. Grabowski *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 282-291 refs (For primary document see N82-25680 16-46)
Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

The principle, design and data evaluation method of a rocket experiment for measuring ionospheric electric fields in situ are presented. Electric field strength is derived from the potential difference between two points according to the relation E x 1 = (phi 1 - phi 2), where E is the field vector, 1 is the distance vector pointing from point 1 to point 2, and phi 1 and 2 are the potentials at the points. A quasiharmonic signal is obtained by measuring the potential difference between the probes of a probe pair perpendicular to the rotation axis of the payload. The trend, (the longtime offset from zero), represents the contact potential difference. The envelope of the amplitude relative to the trend represents the absolute value of the field component perpendicular to the rotation axis, seen in a moving but nonrotating reference frame fixed to the payload. The phase of the quasiharmonic signal represents the direction of this frame. Trend, amplitude, and phase are evaluated by numerical Fourier transformation techniques analagous to filtering and demodulation techniques in communication theory. A quick look electric field value of 10 mV/M is reported.
Author (ESA)

N82-25700# Graz Univ. (Austria).
A LOW ENERGY PARTICLE SPECTROMETER WITH A LARGE GEOMETRIC FACTOR Final Report
A. Urban *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 292-301 refs Sponsored by Austrian Council for Science Research and Austrian Acad. of Sciences (For primary document see N82-25680 16-46)
Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

The design and calibration of a rocket-borne detector, using a channel electron multiplier (CEM) together with a spherical electrostatic analyzer, are described. The CEM characteristic equivalent energy bandwidths, opening angles and operating range are defined, and are given as functions of energies between 0.1 to 25 keV. The electronic parts include the analyzer deflection and the CEM acceleration high voltage components, measurement control unit, and data processing interfaces. Numerical analysis of the geometric factor from the calibration data is demonstrated. The energy and pitch angle distributions of energetic electrons using 30 and 90 deg sensors during a 150 to 176 sec flight time interval are analyzed. The 90 deg sensor shows a nearly constant energy spectrum throughout, while the 30 deg sensor exhibits large variations. Differences are attributed to changes in pitch angle distribution.
Author (ESA)

N82-25701# Fraunhofer Inst., Freiburg (West Germany).
THE THERMAL PLASMA EXPERIMENT RETARDING POTENTIAL AND ENERGY SELECTING ANALYZER (RPEA). DESCRIPTION OF THE EXPERIMENT AND FIRST QUICK LOOK RESULTS Final Report
A. Dumbs *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 302-309 refs (For primary document see N82-25680 16-46)
Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

A rocket-borne experiment which studies ionospheric electron temperature, near thermal electron fluxes, plasma density and ion temperature is described. The experiment consists of two retarding potential analyzers (RPA) with an electrostatic particle deflector for electron measurements and a magnetic one for ion measurements. With these additions, measurement of electron and ion temperatures is not influenced by high energetic fluxes, and differential flux measurements are superior to integral ones. Electron and ion measurements do not disturb each other. Despite these modifications the basic simplicity of the RPA is maintained. The two RPEA sensors are mounted on booms and measure continuously. Results indicate that electron temperatures are anisotropic, indicating that polar plasma cannot always be described by a temperature.
Author (ESA)

N82-25702# Bonn Univ. (West Germany). Inst. of Physics.
THE BUGATTI EXPERIMENT FOR TURBOPAUSE AND TURBULENCE INVESTIGATIONS Final Report
J. Wirth and U. vonZahn *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 310-323 refs (For primary document see N82-25680 16-46)
Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

A rocket-borne experiment which determines the eddy coefficient of atmospheric turbulence and altitude variations of the coefficient is described. The absolute N2 and Ar densities in the altitude range from 95 to 125 km are measured with a spatial resolution < 100 m. These profiles are used to derive the temperature profile in combination with the altitude profile of total mass density, the altitude profile of the strength of eddy mixing, the height of the turbopause (where the molecular diffusion coefficient equals the eddy coefficient), and presence and amplitudes of gravity waves. The gas analyzer is a double focusing magnetic mass spectrometer. Data are collected on the down leg of the trajectory. Of three experiments launched, one failed due to launch vehicle underperformance and two were successful.
Author (ESA)

N82-25703# Norwegian Defence Research Establishment, Kjeller.
EXPERIMENTS FOR MEASURING THE ENERGETIC CHARGED PARTICLE PRECIPITATION Final Report
E. V. Thrane, R. Christensen, and B. Grandal *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 324-328 refs (For primary document see N82-25680 16-46)
Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

A solid state telescope and a Geiger counter flown in three salvos in the energy budget campaign E4 payload are described. The telescope resolves electron energies in the 38 to 800 keV range, and distinguishes electrons from protons. A totally deployed front detector is penetrated by incident electrons with energies > 185 keV, and protons with energies > 4 MeV. A partially deployed rear detector resolves electron energies up to 800 keV and measures the integral flux of electrons with higher energies. The counter has a low energy cut off of 40 keV, determined by the 50% transmission point of the detector window. The geometric factors are 0.14 sq cm sr for the telescope, 0.0324 sq cm sr for the counter. One test was succesful, but

the others failed due to delays in turning on the high voltage supply. Author (ESA)

N82-25704# Bergen Univ. (Norway). Dept. of Physics.
PARTICLE AND X RAY EXPERIMENTS ON THE E4 ROCKETS Final Report
Jon Bjordal and Finn Soeraas *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 329-339 (For primary document see N82-25680 16-46)
Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

Electron count rate and energy flux measurement and X-ray count rate experiments are described. A solid state detector mounted at 45 deg to the rocket axis measures electrons in six energy channels from 15 to 200 keV. Its geometric factor is 0.05 sq cm sr. The X-ray instrument consist of a 38 mm diameter NaI(T1) scintillator mounted on a PM tube, collimated to a field of view of 34 by 34 deg FWHM. It looks at 45 deg to the rocket axis parallel to the electron detector. Broom magnets prevent electrons from hitting the scintillator. Data are recorded on five integral energy channels, from 3 to 48 keV. The particle experiments measure local fluxes of precipitating electrons while the X-ray experiment map the surrounding precipitation regions by scanning the sky above the rockets during early and late parts of the flights. The X-ray experiments work well, recording significant fluxes above background on the rockets F 53 (E4 salvo EBC-B) and F 54 (E4 salvo EBC-C). No data were received from rocket F 52 (salvo EBC A1). Author (ESA)

N82-25705# Science Research Council, Chilton (England). Rutherford and Appleton Labs.
ROCKET-BORNE EXPERIMENTS FOR SIMULTANEOUS MEASUREMENT OF ATOMIC OXYGEN CONCENTRATION, ELECTRON DENSITY AND GAS TEMPERATURE Final Report
P. H. G. Dickinson, E. R. Williams (Univ. College, Wales, UK), and D. B. Jenkins (Univ. College, Wales, UK) *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 340-350 refs (For primary document see N82-25680 16-46)
Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

Atomic oxygen measurement, using fluorescence, and absorption, ionospheric electron density measurement using spherical Langmuir probes, and gas temperature measurement, using double wire thermometers, are described. The 0 (3P) concentration is determined from measurements of resonant fluorescence and absorption at the triplet OI (3 Pj - 351), j = 2,1,0 at 130.22, 130.49, and 130.60 nm. The triplet is emitted by a UV resonance lamp. Lamp emission is detected by a Ca F2/NO gas gain ionization chamber. Calibration is corrected for off axis emission. In the fluorescence experiment, a side window photomultiplier views part of the gas illuminated by the lamp. The signal is calibrated by comparison with the absorption experiment for atom concentrations > 50 billion per cu cm, and by linear extrapolation of this calibration for lower concentrations. Temperature is measured by a hot-wire anemometer with two platinum wires, one treated in a controlled vacuum process which modifies its thermal accomodation coefficient. Uncalibrated atomic oxygen and Langmuir probe results are given.
Author (ESA)

N82-25706# Air Force Geophysics Lab., Hanscom AFB, Mass.
ATMOSPHERIC STRUCTURE MEASUREMENTS FROM ACCELEROMETER INSTRUMENTED FALLING SPHERES Final Report
C. R. Philbrick, J. P. McIsaac, D. H. Fryklund (Accumetrics Corp.), and R. F. Buck (Oklahoma State Univ.) *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 352-361 refs Sponsored by Bundesministerium fuer Forschung und Technologie (For primary document see N82-25680 16-46)
Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

A three axis piezoelectric accelerometer, mounted in a 25 cm diameter sphere was used to measure atmospheric density and winds and to obtain a temperature profile in the altitude range from 50 to 150 km. The sphere with its own telemetry system and beacon transponder was released from a rocket at 70 km altitude on the up leg of the flight. The drag acceleration measured by the accelerometer can be used to directly calculate the atmospheric density with a vertical resolution of 100 m. The wind field is calculated, assuming uniform distribution in the horizontal plane between the up and down leg regions, which are 30 km apart. The atmospheric temperature profile is determined by integrating along the density profile, assuming ideal gas law conditions and hydrostatic equilibrium. The profiles obtained from the density, temperature and wind profiles can be used to describe those regions of the atmosphere expected to be statically and dynamically unstable. Author (ESA)

N82-25707# Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau (West Germany).
THE FOIL CLOUD EXPERIMENT: SOME RESULTS OBTAINED DURING THE ENERGY BUDGET CAMPAIGN NOVEMBER 1980 Final Report
Hans-Ulrich Widdel *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 368-381 refs (For primary document see N82-25680 16-46)
(Grant BMFT-WRK-275)
Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

An experiment for measuring local wind speed and direction in the altitude range from 94 to 70 km is described. Radar reflecting strips are ejected backwards opposite to the direction of rocket flight. A tuned system of overpressure in the storage canister and gas jets at the end of the canister help separate the individual strips from each other, compensate centrifugal forces caused by the spin of the rocket, and generate a density distribution inside the cloud which increases towards its center. This density compensates the effect of diffusion of the foils during descent. A larger height coverage is obtained than with ordinary chaff, provided that no violent wind shears are present. During disturbed conditions the cloud descends much faster than expected in a narrow interval near 80 km, and indicates an ascending motion between 72 and 74 km. Deviations from a smooth track are small, but more frequent than during calm conditions.
Author (ESA)

N82-25708*# National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, Va.
ATMOSPHERIC DENSITY, TEMPERATURE AND WIND MEASUREMENT TECHNIQUES DURING THE 1980 ENERGY BUDGET CAMPAIGN Final Report
F. J. Schmidlin, C. R. Philbrick (Air Force Geophysics Lab.), and D. Offermann (Wuppertal Univ., West Germany) *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 382-396 refs (For primary document see N82-25680 16-46)
Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90 CSCL 04A

Super Loki rocketsonde systems are described. The datasonde telemeters data to a ground station where ambient temperatures are calculated between 20 and 70 km. The sphere is a passive, radar tracked system which allows density to be calculated between 30 and 90 km. When flown simultaneously the systems give redundant data in the altitudes between 30 and 70 km. The datasonde has a balloon parachute that descends more slowly than a conventional parachute and is more stable. Because of launch constraints the datasondes reached very high apogees, leading to very fast descent velocities. Aerodynamic heating reduced thermistor sensitivity. Anomalous parachute behavior influenced wind sensing until a denser layer was reached. The spheres collapsed above 60 km altitude, but their data, combined with dropsonde data give significant results for 21 flights. These show that the stratosphere is colder than Cospar 72 model predictions and the mesosphere is warmer.
Author (ESA)

N82-25709*# Utah State Univ., Logan.
ROCKETBORNE MEASUREMENTS OF INFRARED SPECTRA AND RELATED PARAMETERS Final Report
J. C. Ulwick, K. D. Baker, L. C. Howlett, A. T. Stair, Jr. (Air Force Geophysics Lab.), and N. B. Wheeler (Air Force Geophysics

Lab.) *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 397-405 refs (For primary document see N82-25680 16-46)
Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90 CSCL 04A

Auroral IR emission over the spectral range 4.0 to 22 microns (2500 to 450/cm) with up to 3% resolution was measured by a liquid helium cooled circular variable filter spectrometer. Ultraviolet emission from the N2 first negative band system and visible emission of the oxygen green line were recorded by onboard photometers. Total electron energy deposition was measured by a scintillator, and electron density by a DC probe. The atomic oxygen concentration was measured by resonance scattering. The payload was launched during significant Joule heating of the upper atmosphere. The highest gain spectral channel shows double peaks at 5.3 microns, and peaks at 9.6 and 15 microns, with saturated 15 microns emission. Photometer results of telemetry as a function of time indicate a low intensity auroral background with strong electron flux pulsations. Author (ESA)

N82-25710*# Illinois Univ. at Urbana-Champaign, Urbana. Aeronomy Lab.
AN INTEGRATED PAYLOAD FOR STUDIES OF THE LOWER IONOSPHERE IN THE AURORAL ZONE Final Report
L. G. Smith *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 406-415 refs (For primary document see N82-25680 16-46)
(Grant NGR 14-005-181)
Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90 CSCL 04A

Three Taurus Orion payloads flown in the energy budget campaign are described. Ionospheric electron concentration and temperature are measured by established probe and propagation techniques. Solid state detectors measure energetic particles. Payloads include an ion mass spectrometer and a particle bunching experiment. Other instrumentation includes a gyroscope, two systems for telemetry, two for tracking and one for recovery. An erasable, programmable, read-only memory device in a Z80 microprocessor helps to convert linear pulse height measurements to logarithmic form. Energy spectra are subdivided by pitch angle, using the spin magnetometer as a reference. Pulse height analyzer data must be corrected in order to compensate for high count rates. Author (ESA)

N82-25711# Bern Univ. (Switzerland). Physikalisches Inst.
MASS SPECTROMETER FOR ION COMPOSITION MEASUREMENTS IN THE LOWER IONOSPHERE Final Report
E. Kopp, L. Andre, P. Eberhardt, and U. Herrmann *In* Wuppertal Univ. Sounding Rocket Program Aeronomy Project: Energy Budget Campaign 1980. Expt. Summary Dec. 1981 p 416-423 refs Sponsored by Swiss Natural Science Foundation (For primary document see N82-25680 16-46)
Avail: NTIS HC A18/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 58,90

Rocket-borne positive and negative ion mass spectrometers are described. The positive instrument consists of a liduid He cryopump with ion transfer optics, followed by a magnetic sector type mass spectrometer. Ambient ions and neutral gas enter through a 2 mm dia orifice. Two 0.4 mm wide exit slits in the focal plane, with two independent analog electron multipliers are used as ion detectors. Ion attraction potential is -3V, except at apogee (-10V). Mass spectrometer resolution is M/Delta M = 75 for a 1% valley. It covers masses from 14 to 180 amu. The negative spectrometer is similar, apart from the ion detector, which has two pulse-counting curved channeltrons. Three successfull flights are reported. Author (ESA)

N82-25712# Scripps Institution of Oceanography, La Jolla, Calif. Visibility Lab.
AN OPERATIONAL TECHNIQUE FOR ESTIMATING VISIBLE SPECTRUM CONTRAST TRANSMITTANCE Interim Scientific Report
Wayne S. Hering Jun. 1981 33 p refs
(Contract F19628-78-C-0200; AF Proj. 7670)
(AD-A111823; SIO-82-1; AFGL-TR-81-0198; ISR-16) Avail: NTIS HC A03/MF A01 CSCL 04/1

Simultaneous optical and meteorological measurements between ground level and 6 km gathered by the Visibility Laboratory in recent years in the United States and Europe with an instrumented aircraft provide the basis for the development of a technique for estimating atmospheric path radiance and directional contrast transmittance. The technique is relatively fast and easy to apply yet is designed to take full advantage of the present capability to observe and predict the relevant atmospheric variables. Various modelling approximations are introduced to simplify the calculations of radiative transfer and to help specify the vertical distribution of atmospheric attenuation coefficient and the single scattering phase function. Critical examinations of the assumptions and approximations were made through reference to the extensive series of airborne meteorological/optical measurements. GRA

N82-25713# Emmanuel Coll., Boston, Mass. Physics Research Div.
LONG-TERM INTENSITY DECREASE IN THE 8-25 MeV PROTON FLUXES AT LOW L VALUES Scientific Report, 1 Mar. 1980 - 28 Feb. 1981
Daniel R. Parsignault, Ernest Holeman, and Robert C. Filz Sep. 1981 21 p refs
(Contract F19628-79-C-0102; AF Proj. 2311)
(AD-A111825; AFGL-TR-81-0303; SR-3) Avail: NTIS HC A02/MF A01 CSCL 04/1

A five year continuous observation, 1963 to 1968, of the 8-25 MeV proton population, at L < 2.0, had shown a monotonic decrease in this population. We have observed the same proton population from 1970 to 1976, using experiments flown on several USAF satellites (72-1, S3-2, S3-3). These data together with published data from the DIAL satellite show that the decreases in the proton fluxes first observed from 1963 to 1968 have continued unabated, at least until August 1976, and with the same original mean lives. The proton flux at L = 1.35 decayed over the 13-year period (1963-1976) with a mean life, tau, of 5.7 + or - 0.5 years. At L = 1.90, tau was 4.55 + or - 0.16 years. However, the proton flux at L = 1.20, which had first been reported as constant, started decreasing approx. 1970 to 1976 with tau = 3.07 + or - 0.25 years. Possible explanations for this phenomenon can be divided into the two categories of natural and artificial effects. We reviewed these different effects and conclude that most likely we are seeing the decay of the high energy protons redistributed by the 'Starfish' high altitude nuclear explosion. Author (GRA)

N82-25714# Emmanuel Coll., Boston, Mass.
COMPARISON OF IONOSPHERIC SCINTILLATION STATISTICS FROM THE NORTH ATLANTIC AND ALASKAN SECTORS OF THE AURORAL OVAL USING THE WIDEBAND SATELLITE
Sunanda Basu, Sanimay Basu, Robert C. Livingston (SRI International, Menlo Park, Calif.), Herbert E. Whitney, and Eileen MacKanzie Hanscom AFB, Mass. AFGL 15 Sep. 1981 132 p refs
(Contract F19628-81-K-0011; AF Proj. 4643)
(AD-A111871; AFGL-TR-81-0266; AFGL-ERP-753) Avail: NTIS HC A07/MF A01 CSCL 04/1

Phase and amplitude scintillation measurements made at 138 MHz at two widely separated auroral stations, Goose Bay, Labrador, and Anchorage, Alaska, are presented. The phase coherent transmissions obtained from the sun-synchronous Wideband satellite were used for this purpose. The data were obtained for part of the year 1979 during a high sunspot epoch and was terminated by the failure of the Wideband satellite in August, 1979. The primary objective of the report is the presentation of scintillation statistics in a manner required for communications system planning. The morphology at the two stations was found to be significantly different with more nighttime scintillations observed at Goose Bay, while many more daytime scintillations were observed at Anchorage during the same season. The report establishes the existence of L-shell aligned sheets in the daytime in addition to the well-established similar geometry at night. The existence of sheetlike irregularities during the daytime well-equatorward of the auroral oval is significant both from modeling and physical standpoints.
Author (GRA)

N82-25715# Naval Research Lab., Washington, D. C. Geophysical and Plasma Dynamics Branch.
IONOSPHERIC IRREGULARITY PHYSICS MODELLING Interim Report
S. L. Ossakow, M. J. Keskinen, and S. T. Zalesak 9 Feb. 1982 53 p refs Presented at the AIAA 20th Aerospace Sci. Conf., Orlando, Fla., 11-14 Jan. 1982
(AD-A111452; NRL-MR-4741) Avail: NTIS HC A04/MF A01 CSCL 04/1

Theoretical and numerical simulation techniques have been employed to study ionospheric F region plasma cloud striation phenomena, equatorial spread F phenomena, and high latitude diffuse auroral F region irregularity phenomena. Each of these phenomena can cause scintillation effects. The results and ideas from these studies are state-of-the-art, agree well with experimental observations, and have induced experimentalists to look for theoretically predicted results. One conclusion that can be drawn from these studies is that ionospheric irregularity phenomena can be modelled from a first principles physics point of view. Theoretical and numerical simulation results from the aforementioned ionospheric irregularity areas will be presented.
Author (GRA)

N82-25716# Maryland Univ., College Park. Lab. for Plasma and Fusion Energy Studies.
ANOMALOUS RESISTIVITY OF AURORAL FIELD LINES Interim Report
H. L. Rowland, P. J. Palmadesso, and K. Papadopoulos Washington NRL 25 Jan. 1982 9 p refs
(AD-A111266; NRL-8537) Avail: NTIS HC A02/MF A01 CSCL 04/1

Conditions that exist along auroral field lines (del n sub i/n sub 0 > 0.24 Omega sub e/omega sub > 1) act to break the adiabatic invariance of the electron magnetic moment, cause strong anomalous dc resistivity, and generate electron distributions in good agreement with observations. Author (GRA)

N82-25717# Physical Dynamics, Inc., Torrance, Calif.
THE EXCITATION OF ATMOSPHERIC GRAVITY WAVES BY UNSTABLE SHEARS Final Technical Report, 1 Feb. 1981 - 31 Jan. 1982
David C. Fritts Jan. 1982 64 p refs
(Contract F49620-81-C-0009; AF Proj. 2310)
(AD-A111516; PD-NW-82-260R; AFOSR-82-0100TR) Avail: NTIS HC A04/MF A01 CSCL 08/14

Research performed under this AFOSR contract addressed two aspects of gravity wave excitation by unstable shear layers in the atmosphere; the non-linear excitation of radiating gravity waves and the response of the mean velocity profile to gravity wave growth and decay. Gravity excitation via the nonlinear interaction of two smaller-scale Kelvin-Helmholtz (KH) instabilities was found to be significantly faster than that predicted by linear stability analysis, accounting for the geophysical significance of such waves. Gravity waves excited in this manner were observed to achieve large amplitudes and to be very localized during excitation. Mean velocity profiles were found to respond in several ways to evolving, unstable gravity waves. Radiating waves excited by the nonlinear interaction of two KH modes were observed to produce relatively small mean flow accelerations away from the shear layer because of source shear stabilization by the KH modes. Large mean flow accelerations were induced by unstable modes evolving in isolation. These results suggest that gravity waves generated by unstable shears may be important in the transport of energy and momentum throughout the atmosphere.
GRA

N82-25718# Naval Research Lab., Washington, D. C.
THE S3-4 IONOSPHERIC IRREGULARITIES SATELLITE EXPERIMENT: PROBE DETECTION OF MULTI-ION COMPONENT PLASMAS AND ASSOCIATED EFFECTS ON INSTABILITY PROCESSES Interim Report
E. P. Szuszczewicz, J. C. Holmes, and M. Singh 11 Feb. 1982 31 p refs
(RR0330244)
(AD-A111456; NRL-MR-4728) Avail: NTIS HC A03/MF A01 CSCL 04/1

The pulsed plasma probe technique was expanded to include simultaneous determinations of absolute electron density, density fluctuations, electron temperature, and mean ion mass with resolution limited only by probe geometry, sheath size, and telemetry. The technique is designed to test for coupling of electron density variations and ion composition irregularities in multicomponent plasmas by the comparison of electron density fluctuation power spectra PN(k) and a newly developed diagnostic parameter, the mean ion mass fluctuation spectra Delta M sub i bar/M sub i bar approaches the limit of P sub M(k). In addition, the experiment extends satellite-borne irregularity spectral analyses down to the 5 to 20 meter range while attempting to synthesize F-region plasma instability processes on the basis of N sub e, T sub e Delta N sub e, P sub N and P sub M. Results demonstrate the expanded diagnostic capability for high spatial resolution measurements of mean ion mass and provide experimental evidence for the role of ion composition in multistepped plasma instability processes. Limited analyses of the two power spectral elements raises hopes for the differential between plasma mechanisms that can lead to similar indices in PN. Author (GRA)

N82-25719# Systems Science and Software, La Jolla, Calif.
MODELING OF BLOCK MOTIONS DUE TO A BURIED EXPLOSION. EXCITATION OF ACOUSTIC WAVES BY SEISMIC SOURCES Semiannual Report, 10 Aug. 1981 - 10 Jan. 1982
J. L. Stevens, S. M. Day, H. J. Swanger, T. G. Barker, B. Shkoller, E. J. Halda, and J. Bernard Minster Jan. 1982 49 p refs
(Contract F49620-81-C-0093; ARPA Order 4332; AF Proj. 2309)
(AD-A111500; SSS-R-82-5376; AFOSR-82-0103TR) Avail: NTIS HC A03/MF A01 CSCL 20/1

A study conclusions include: (1) qualitative effects of block motions in axisymmetric geometry on the outgoing radiation field are usefully described by an analytical model if the boundary condition across them slipping interface is linear. Comparison between analytical and numerical results shows that our numerical treatment of imperfectly bonded joints in a rock mass is correct and accurate; (2) quantitative agreement between numerical simulations and field observations is achieved for a rate independent dry friction boundary condition, with a kinetic friction coefficient of 0.77; and (3) in axisymmetric geometry, an equivalent seismic source which accounts for block motion contains both dipole and octuopole terms. Evaluation of these contributions to the elastodynamic radiation field, for both linear and nonlinear boundary conditions shows that this equivalent source is a very poor radiator at long periods, and cannot lead to surface wave reversals. Also reported is an investigation of acoustic coupling of seismic waves. We have validated the results of previous simulations of this phenomenon which used the San Fernando earthquake, reviewed the literature to determine the range of source parameters to be expected for earthquakes of magnitude of approx. 4.0, and are proceeding with the modeling of near source ground motion associated with a well recorded aftershock of the Oroiville sequence. GRA

N82-25720# Systems Science and Software, La Jolla, Calif.
REGIONAL DISCRIMINATION RESEARCH Interim Final Report, 1 May 1980 - 31 Mar. 1981
T. J. Bennett, D. G. Lambert, J. R. Murphy, J. M. Savino, and C. B. Archambeau Alexandria, Va. VELA Seismological Center Jun. 1981 87 p refs
(Contract F08606-80-C-0016; ARPA Order 2551)
(AD-A112106; SSS-R-81-5032; VSC-TR-81-20) Avail: NTIS HC A05/MF A01 CSCL 08/11

The objective of this project is to systematically assess the potential of regional phases for discriminating earthquakes and nuclear explosions with particular emphasis on defining the applicability of such discriminants to events in various regions of the U.S.S.R. The first research approach employs more traditional, time domain amplitude and period measurements to compare the relative excitation of different regional phases from earthquakes and explosions. The second approach focuses on the evaluation of the capabilities of other measurement or processing techniques, such as spectral ratios or narrow-band filtering, to identify seismic sources using regional phases. The principal technical phases of the regional discrimination research effort are: (1) review and assess time and frequency domain characteristics of regional seismic phases and evaluate their

dependency on source type, propagation path and station environment; (2) develop a tentative set of source identification criteria based on information from regional phases; and (3) test proposed regional discriminants on observed data to determine their capability to identify earthquakes and explosions in various tectonic and geologic settings. GRA

N82-25721# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.

ATMOSPHERIC PRESSURE AND VELOCITY FLUCTUATIONS NEAR THE AURORAL ELECTROJET

Janet G. Luhmann 15 Jan. 1982 40 p refs

(Contract F04701-81-C-0082)

(AD-A111640; TR-0082(2940-05)-2; SD-TR-81-105) Avail: NTIS HC A03/MF A01 CSCL 04/1

The low frequency pressure and velocity perturbations caused by the temporally varying Lorentz force associated with auroral electrojet activity are modelled by calculating the disturbances generated by a two-dimensional, time-dependent current system in a gravitationally stratified, isothermal, windless atmosphere. These calculations provide information about the pattern of gravity waves around the hypothetical electrojet and give estimates of the magnitudes of near-field auroral disturbances in the middle atmosphere. It is suggested that the near-field vertical wind shears may be large enough to affect the development of air turbulence in the auroral zone. Author (GRA)

N82-25722# Ohio State Univ., Columbus. Dept. of Geodetic Science and Surveying.

THE ESTIMATION OF FREE-AIR ANOMALIES

Hans Suenkel Hanscom AFB, Mass. AFGL Sep. 1981 77 p refs

(Contract F19628-79-C-0075; AF Proj. 7600)

(AD-A108880; Rept-315; SCIENTIFIC-9; AFGL-TR-81-0289) Avail: NTIS HC A05/MF A01

A prediction model of point and/or mean free-air anomalies, based on point values, is proposed. It relies on the concept of least-squares collocation with parameters. The model parameters are the two regression parameters of a linear model, which assumes a linear correlation between free-air anomaly and elevation. Particular emphasis is put on the role of the topography in mountainous areas. Author (GRA)

N82-25723# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.

NORMAL GAUGE IN SUPERGRAVITY

V. Ogievetsky and E. Sokatchev 1980 14 p refs In ENGLISH; RUSSIAN summary Submitted for publication

(JINR-E-2-80-127) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

In the gauge proposed, a large number of derivatives of the axial gravitational superfield H sup m vanish at a given point in superspace. The remaining derivatives of H sup m are the values at z sub 0 of the basic superfields R, anti R, G, W, anti W in terms of which torsion and curvature are expressible. The normal gauge simplifies significantly many considerations and calculations in supergravity. DOE

N82-25724# Joint Inst. for Nuclear Research, Dubna (USSR) Lab. of Theoretical Physics.

TORSION AND CURVATURE IN TERMS OF THE MOLYBDENUM TUBES AXIAL GRAVITATIONAL SUPERFIELD

V. Ogievetsky and E. Sokatchev 1980 16 p refs Submitted for publication

(JINR-E-2-80-138) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The usage of a geometric approach in the axial gravitational superfield is considered. The components of the torsion and curvature tensors in supergravity are explicity expressed in terms of the derivatives of the axial superfield. The derivation is considerably simplified by the use of normal gauge in supergravity. The obtained results agree with the Grimm, Wess and Zumino data. DOE

N82-25725# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Moscow (USSR). Inst. of Theoretical and Experimental Physics.

SUPERGRAVITY AND FIELD SPACE DEMOCRACY

A. V. Gayduk, V. H. Romanov, and A. S. Schwarz 1980 43 p refs

(ITEP-136(1980)) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

Supergravity is presented in which field and space variables are on an equal footing. The action functional of supergravity is characterized as the functional, defined on the space of (4,4)-dimensional submanifolds of complex (4,2)-dimensional superspace, which is invariation with respect to supervolume preserving analytic transformations. It is shown how the Lagrangian of the supergravity in the Ogievetsky-Sokatchev form can be obtained by means of this characterization and describe natural mutli-dimensional generalizations of this Lagrangian. These generalizations are based on the notion of perfect action functional. DOE

N82-25726# Los Alamos Scientific Lab., N. Mex.

EXPLOSIVELY PRODUCED FRACTURE OF OIL SHALE Progress Report, Jul. - Sep. 1980

Oct. 1981 38 p

(Contract W-7405-eng-36)

(DE82-004182; LA-9045-PR) Avail: NTIS HC A03/MF A01

Explosive cratering experiments were conducted as a part of the research effort to study the explosively produced fracture of oil shale. They were designed to identify and analyze the major factors involved in the fracturing of oil shale, to provide data for the verification of the computer models, and ultimately to lead to the design of a rubble bed for in situ retorting oil shale. The rubble excavated from eight cratering experiments was separated and the volumes of rubble in each screened size category are presented. Also presented are the data from the detailed investigation of the joint/fracture attitudes (strikes and dips) within a crater interior after excavation. The data were tabulated and plotted to allow future comparisons and analyses pertinent to similar experiments. A brief discussion of the experiment site and the graphical representation of the data are included. Finally, since the homogeneity of the oil shale is an important consideration in the selection of a site for these explosive fracture experiments, cores were taken and analyzed. The identification of the geological parameters and their extent and how they delineate the overall characterization of the experiment site, including the subsurface geology, is given. It is shown how the postshot core analysis will indicate how the blast affected the rock. M.D.K.

N82-25727# Physics Lab. RVO-TNO, The Hague (Netherlands). Research Group 2: Ver Infrarood.

INFRARED TRANSMISSION OF THE ATMOSPHERE IN THE NORTH ATLANTIC AREA AND ABOVE THE NETHERLANDS

P. J. deKok Feb. 1981 58 p refs In DUTCH; ENGLISH summary

(PHL-1981-06; TDCK-75340) Avail: NTIS HC A04/MF A01

The IR component of sky radiation for wavebands between 0.4 and 12 microns was calculated using the program LOWTRAN 4. Using annual averaged values of weather data of the Netherlands and a part of the North Atlantic Ocean, the probability of transmission as a function of range is computed. The values are for a horizontal path at sea level. The average transmission at shortest wavelengths (0.4 to 1.0 microns) is larger at the North Atlantic ranges than in the Netherlands. At longer wavelengths (> 2 microns) the average transmission in the Netherlands is better. Author (ESA)

N82-25728# Research Inst. of National Defence, Stockholm (Sweden).

INVESTIGATION OF A COMPUTER ALGORITHM FOR AUTOMATIC ASSOCIATION OF ARRIVALS USING SYNTHETIC DATA

Harriet Ohlsson Mar. 1982 21 p refs

(FOA-C-20447-T1) Avail: NTIS HC A02/MF A01

Three methods for analyzing seismic data are compared, using a data set with no aftershocks, swarms, or false alarms. Procedure 1 uses P-wave and depth phase arrival times. Five arrivals are required to define an event. Automatic association consists of applying the same algorithm first without event locations, then using locations from the first pass as trial hypocenters. Procedure 2 requires a minimum of three arrivals

to define an event. The program uses array information for trial epicenters. Solutions for three or four arrivals are computed by restraining the depth to zero. Depth phases are not used. Procedure 3 describes seismic events kinematically, using hypocenter parameters. The algorithm for associating the observations into groups works with the kinematic observation to find a possible kinematic event, which is then dynamically checked. Arrivals with inconsistent amplitudes are rejected. Good or fair solutions are obtained for 76% of the events by procedure 1 (104 events observed) 69% for 2 (140) and 74% for 3 (152). Author (ESA)

N82-25729# Oesterreichische Akademie der Wissenschaften, Vienna. Inst. of Space Research.

BALLOON BORNE MEASUREMENTS OF AURORALLY GENERATED X-RAYS, ELECTRIC FIELDS AND INFRASONIC WAVES

H. Slamanig and M. Friedrich (Graz Univ.) 1981 14 p refs
Avail: NTIS HC A02/MF A01

The block diagram of an integrated balloon payload for measuring X-rays, E-fields and rapid temperature variations is presented. The characteristics of the sensors and housekeeping devices are given along with the way their data are coded in a slow PCM telemetry system. The payload consists of a scintillation counter, electric field probes, a high resolution sonic thermometer, and an auroral photometer. An electronic card determines pressure, payload temperature, battery voltage and balloon location. A commercial transducer yields a voltage proportional to pressure. Standard 1/4 in. tape recorders are used for telemetry. For data processing, sync words are omitted from the digital tape, giving a 576-frame record. Author (ESA)

N82-25730# Maine Univ. at Orono. Dept. of Geological Sciences.

USCGC GLACIER 1976 AND 1978 CRUISES. ROSE SEA, ANTARCTICA SEDIMENT DESCRIPTIONS

Thomas B. Kellogg, Davida E. Kellogg, Kevin R. Melanson, and Kathryn G. Austin 1981 81 p refs
(Grant NSF DPP-79-20112)
(PB82-134503; ANTARCTIC-BIB-E-25202; CONTRIB-49) Avail: NTIS HC A05/MF A01 CSCL 08G

The icebreaker collected 36 piston cores and 32 trigger cores from 39 stations. Most cores were taken north of Ross Island, next to the Ross Ice Shelf, and along the 1,000 meter depth north of the Ross Ice Shelf. Longest core is 1,077 centimeters, most are half that length or less. Objectives were to determine the climatic and oceanic history of the region and the west Antarctic ice sheet. GRA

N82-25731# Geological Survey, Reston, Va.

A SUMMARY OF ENVIRONMENTAL GEOLOGIC STUDIES ON THE SOUTHEASTERN UNITED STATES ATLANTIC OUTER CONTINENTAL SHELF Final Open File Report, 1977 - 1978

Peter Popenoe 1981 48 p refs
(PB82-109273; BLM/YL/SR-81/03) Avail: NTIS HC A03/MF A01 CSCL 08G

The outer continental shelf environment is investigated. The methods, techniques, instruments, and procedures utilized in acquiring sound management decisions regarding the development of mineral resources are summarized. GRA

N82-25554*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE EFFECTS OF TROPICAL WIND DATA ON THE PREDICTION OF ULTRALONG WAVES

W. E. Baker *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 14-17 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

N82-25555*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE STATE OF THE ATMOSPHERE AS INFERRED FROM THE FGGE SATELLITE OBSERVING SYSTEMS DURING SOP-1

M. Halem, E. Kalnay, W. E. Baker, and R. Atlas *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 20-36 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

N82-25563*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

A STOCHASTIC-DYNAMIC MODEL FOR GLOBAL ATMOSPHERIC MASS-FIELD STATISTICS

M. Ghil (New York Univ., N.Y.), R. C. Balgovind (Sigma Data Services Corp.), and E. Kalnay *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 81 (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

N82-25565*# National Academy of Sciences - National Research Council, Washington, D. C.

A FOUR DIMENSIONAL VARIATIONAL ANALYSIS EXPERIMENT

R. Hoffman *In* NASA. Goddard Space Flight Center Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 84-86 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

N82-25566*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

A SIMPLE ATMOSPHERIC MODEL ON THE SPHERE WITH 100% PARALLELISM

E. Kalnay and L. L. Takacs *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 89-95 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

N82-25567*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

ON THE EFFECT OF HIGH LATITUDE FILTERING IN GLOBAL GRID POINT MODELS

L. L. Takacs, R. C. Balgovind, M. Iredell, and E. Kalnay *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 96-104 refs Prepared in cooperation with Sigma Data Services Corp. (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

N82-25569*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

A MODEL TO DETERMINE OPEN OR CLOSED CELLULAR CONVECTION

H. M. Helfand and E. Kalnay *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 117-118 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

N82-25570*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

LARGE AMPLITUDE STATIONARY ROSSBY WAVES IN THE SOUTHERN HEMISPHERE

E. Kalnay and M. Halem *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 119-130 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

N82-25571*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE ROLE OF ZONALLY ASYMMETRIC HEATING IN THE VERTICAL AND TEMPORAL STRUCTURE OF THE GLOBAL SCALE FLOW FIELDS DURING FGGE SOP-1

J. Paegle (Utah Univ.), E. Kalnay, and W. E. Baker *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 132-141 refs Presented at Intern. Conf. on Early Results of FGGE and Large-Scale Aspects of Monsoon Exptn., Tallahassee, Fla., 12-17 Jan. 1981 Submitted for publication (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

N82-25572*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

INTEGRATED AND SPECTRAL ENERGY FLOWS OF THE GLAS GCM

J. Tennebaum *In its* Modeling and Simulation Facility: Res.

Rev., 1980 - 1981 Dec. 1981 p 142-144 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

N82-25573*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A NUMERICAL MODEL STUDY OF LONG-TERM PLANETARY WAVE PREDICTABILITY
R. L. Wobus *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 145-146 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

N82-25575*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SEASONAL CYCLE OF HEIGHTS, TEMPERATURES AND SEA LEVEL PRESSURE OVER THE NORTHERN HEMISPHERE
B. Doty and K. C. Mo *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 153-157 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

N82-25576*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANALYSIS OF THE SURFACE HEAT BALANCE OVER THE WORLD OCEAN
S. K. Esbenson *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 158-162 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

N82-25580*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
QUASI-LANGRANGIAN MODELS OF NASCENT THERMALS
S. Rambaldi and D. A. Randall *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 188-192 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

N82-25587*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INFLUENCE OF SURFACE-ALBEDO IN SUBTROPICAL REGIONS ON JULY CIRCULATION
Y. Sud and M. Fennessy *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 237-240 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

N82-26095# Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau (West Germany).
MAGNETOSPHERIC SUBSTORM MORPHOLOGY
G. Kremser *In* ESA The Solar System and its Exploration Nov. 1981 p 77-84 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

N82-26173*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE COUPLED EFFECTS OF CHEMISTRY AND DIFFUSION ON THE STRATOSPHERIC ZONE REDUCTION
R. N. Gupta (Indian Inst. of Technology, Kanpur) and W. L. Grose *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 322, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 95-99 refs Presented at the Space Sci. Symp., VSSC, Trivandrum, India, 18-21 Jan. 1977 (For primary document see N82-26161 16-99)
Avail: NTIS HC A08/MF A01 CSCL 13B

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N82-25732# Weapons Systems Research Lab., Salisbury (Australia).
A METHOD FOR THE ESTIMATION OF THE ATMOSPHERIC TEMPERATURE PROFILE
K. H. Lloyd Nov. 1981 24 p refs
(WSRL-0242-TM; AR-002-788) Avail: NTIS HC A02/MF A01

A method is presented for the estimation of the temperature profile, given measured surface values of temperature and pressure, using conditional factors which are functions of statistical meteorological parameters. Tables of mean temperature profiles, and of the conditional factors from which temperature profiles may be estimated, are presented for several sites around Australia. These tables can be used when, for example, radiosonde data are not available. R.J.F.

N82-25733# University of Central Florida, Orlando. Dept. of Mathematics and Statistics.
MODELING VISIBILITY FOR LOCATIONS IN GERMANY WHERE NO RECORDS EXIST Final Report, 1 Oct. 1979 - 30 Sep. 1981
Paul N. Somerville and Steven J. Bean Hanscom AFB, Mass. AFGL Dec. 1981 39 p refs
(Contract F19628-80-C-0004; AF Proj. 6670)
(AD-A111890; AFGL-TR-81-0313) Avail: NTIS HC A03/MF A01 CSCL 04/2

Using a Weibull model for the probability that visibility will be less than a specified distance, regression equations for the two parameters alpha and beta are developed for West Germany which are functions of geographical and climatological variables. Using these equations in a Weibull model enables us to estimate visibility probabilities for stations with no historical data but for which we are willing to assume values for the climatological and geographical variables used in the equations. Separate models are also developed which, for a specified month and time of day, are valid for the entire region and do not require the values for any other variables. Author (GRA)

N82-25734# Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.
CLOUD TRACKING FROM SATELLITE PICTURES Ph.D. Thesis
Uwe L. Haass Jul. 1981 130 p refs
(Contract F19628-78-C-0207; AF Proj. 6670)
(AD-A111838; AFGL-TR-81-0205; SR-2) Avail: NTIS HC A07/MF A01 CSCL 04/2

Satellite pictures taken in short time intervals are employed to estimate the lateral (x-y) and rotational displacement of clouds. Several methods of motion analysis are introduced based on different signal characterizations and various degrees of image abstraction. Using the discrete luminance information (half-tone picture), the maximum of the inner product surface of two consecutive images serves as a lateral displacement estimator. This dissertation demonstrates how the maximum peak detectability can be improved by prefiltering with a non causal planar least squares inverse filter. Although this filter is derived from theoretical considerations, the resulting high-pass frequency characteristics commends its use for another reason: since most of the cloud information, such as edges and texture, is embedded in the high frequency parts of the image, the subsequent inner product operation takes only the homogeneous displacement of these features into account. For clouds that have undergone severe shape changes, a gradual shift to less restrictive frequency characteristics is suggested. If the luminance values are fit to a bivariate normal surface, clouds or cloud fields can be traced by following the ellipses of equal density. This method retrieves lateral displacement, rotation and size changes. Another technique makes use of a closed contour of the cloud, either the boundary or any contour of constant gray-level. This contour is traced, resampled and transformed into a Fourier descriptor (FD) series. GRA

N82-25735# Naval Research Lab., Washington, D. C. Atmospheric Physics Branch.
REPORT AND ANALYSIS OF THE MAY 1979 MARINE SURFACE LAYER MICROMETEOROLOGICAL EXPERIMENT AT SAN NICOLAS ISLAND, CALIFORNIA Final Report
Theodore V. Blanc 31 Dec. 1981 150 p refs

(ZF39551002)
(AD-A110488; NRL-8363) Avail: NTIS HC A07/MF A01 CSCL 04/2

One hundred thirty-six hours of profile and bulk measurements of momentum, moisture, and sensible heat flux, accompanied by determinations of stability, were made in the marine atmospheric surface layer over the Pacific Ocean from an upwind, low-profile promontory of San Nicolas Island, California, at 33 deg North latitude and 120 deg West longitude. A review of previous marine surface layer profile measurements is presented, and the need for additional high wind speed flux measurements is demonstrated. Extensive analysis of the San Nicolas Island data revealed that the measurements were made upwind and above the internal boundary layer formed by the island. Additionally, a generalized technique was developed for correcting the wind-profile modification induced by the inherent change in elevation associated with many beaches. A comparison with previous profile measurements determined that earlier experimenters had overestimated the accuracy of their humidity measurements and that it was impractical to introduce buoyancy into the stability equation. An analysis performed to determine the relative magnitude of the flux and stability measurement errors associated with both the profile and bulk methods determined that the errors were typically in excess of 100%. Recommendations for future bulk method measurements are presented and a simple two level bulk method is proposed. An extensive bibliography is given, and the topic of horizontal homogeneity of the marine boundary layer is discussed. GRA

N82-25736# Naval Research Lab., Washington, D. C.
THE METEOR SOFTWARE PACKAGE FOR ANALYSIS OF METEOROLOGICAL DATA Final Report
John B. Hoover 27 Jan. 1982 84 p
(AD-A110895; NRL-MR-4674) Avail: NTIS HC A05/MF A01 CSCL 04/1

Four FORTRAN programs, examples of the required inputs, and copies of typical program outputs are described. The METEOR software package was developed to aid in collecting and analyzing meteorological data. The programs sort data according to source, create large data files, process these files, and produce printed and plotted output as required. The programs are written in a modular fashion and the user may select from a variety of options within each program. A command file provides instructions to the various programs. One program is interactive and conducts a dialog with the user. The output of this program is the command file. The remaining three programs require no interaction and may be used in a batch mode. Each of these produces error messages whenever unexpected conditions are encountered. Insofar as possible, these messages were intended to be self explanatory. Each program contains a complete list of error messages and an explanation of each. E.A.K.

N82-25737# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technc'ogy Div.
PERIODICITY OF BORA GUSTS
Z. Petkovshek 14 Jan. 1982 12 p refs Transl. into ENGLISH from the mono. "Periodicnost Sunkov Burje" Ljubljana, Yugoslavia, Superior Technical Organization for Physics, FNT p 67-75
(AD-A110616; FTD-ID(RS)T-1599-81) Avail: NTIS HC A02/MF A01 CSCL 04/2

The characteristics of bora winds and the temporal characteristics like frequency, periodicity and structure of the gusts were studied. An instrument to record bora gusts was constructed. It is found that the periodicity of the most powerful gusts is approximately constant, however, varieties are found in different boras. E.A.K.

N82-25738# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE EFFECT OF RELIEF ON THE WIND FIELD IN THE REGION OF THE WHITE SEA
Ye. P. Veselov 20 Jan. 1982 11 p refs Transl. into ENGLISH from Prognoz Baricheskogo Poly i Opasnykh Yavleniy Pogody, Tr. Gidrometeorol. Nauch.-Issled. Tsentr. SSSR (USSR), no. 32, 1968 p 83-85
(AD-A110608; FTD-ID(RS)T-1609-81) Avail: NTIS HC A02/MF A01 CSCL 04/2

The calculation of wind velocity in topographically complex regions was studied. Utilization of empirical coefficients for different points of regions which indirectly consider the local special features of relief is examined. The White Sea has an exceptional diversity of physiographical conditions. These conditions allow the determination of coefficients for different points and enable a more detailed forecasting of the regional winds. E.A.K.

N82-25739# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE CLIMATE IN THE REGION OF DJERDAP. THE IRON GATE
Katarina Milosavljevic 21 Jan. 1982 20 p refs Transl. into ENGLISH from Wetter und Leben Z. fuer Angew. Meteorol. (East Germany), v. 23, 1971 p 52-61
(AD-A110601; FTD-ID(RS)T-1622-81) Avail: NTIS HC A02/MF A01 CSCL 04/2

Climatological characteristics of the Iron Gate (Djerdap) East Serbia, Yugoslavia, region were studied. The atmospheric temperature distribution in this region shows harsher conditions in the eastern part than in the western part. It is found that the climatological conditions are most favorable from May to September. The large storage lake will moderate the winter and summer extreme conditions. E.A.K.

N82-25740# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE BORA PHENOMENON IN EASTERN KAZAKSTAN
B. P. Alisos 29 Jan. 1982 27 p Transl. into ENGLISH from Zh. Geofiz. (USSR), v. 5, no. 1, 1935 p 99-115
(AD-A110986; FTD-ID(RS)T-1617-81) Avail: NTIS HC A03/MF A01 CSCL 04/2

Hurricane-force winds on the north shore of Lake Balkhash were studied. N.W.

N82-25741# Naval Research Lab., Washington, D. C.
A TIME-DEPENDENT OCEANIC AEROSOL PROFILE MODEL Interim Report
Stuart G. Gathman 10 Feb. 1982 38 p refs
(ZF595551002)
(AD-A111148; NRL-8536) Avail: NTIS HC A03/MF A01 CSCL 04/2

A model is presented which will describe the time evolution of oceanic aerosol. The model is designed to operate on a desk top computer (Tektronix 4052) and is written in the easy to understand BASIC language. The model is based on the physical processes operating on a column of air as it travels with the wind over the ocean. Inputs to the model are the time history (or forecasts) of six surface observable parameters: air temperature, cloud cover, dewpoint, windspeed, sea surface temperature, and the inversion height. The output of the model is a series of aerosol concentration profiles every 10 minutes of one particular dry size of aerosol. Provisions are made for tandem runs for different dry sized particles so that size distributions of aerosols can be plotted as they evolve over time. The model takes into account the production of oceanic aerosol at the sea surface by white caps and spray and the changes in droplet sizes as a function of the relative humidity profile as well as the mixing processes as it changes with both time and altitude.
Author (GRA)

N82-25742# Weather Wing (3rd), Offutt AFB, Nebr. Aerospace Sciences Div.
SATELLITE INTERPRETATION
Eugene M. Weber and Steven Wilderotter 28 Dec. 1981 109 p
(AD-A111956; Rept-3WW/TN-81-001) Avail: NTIS HC A06/MF A01 CSCL 04/2

This Technical Note describes cloud formations as seen on enhanced infrared and visible GOES satellite photographs and attempts to relate the meteorological causes for these formations. Some of the latest techniques developed by NESS have been included. This Technical Note is designed to be used as a base reference for comprehensive training in the analysis, interpretation, and application of satellite data in making forecasts. GRA

N82-25743# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

RYTERSKI AND RYMANOWSKI WINDS
Janina Lewinska 12 Feb. 1982 14 p refs Transl. into ENGLISH from Przegl. Geofiz. (Poland), v. 3(11), no. 1, 1958 p 17-26 (AD-A111966; FTD-ID(RS)T-1715-81) Avail: NTIS HC A02/MF A01 CSCL 04/2

A description of the winds in the valleys of the Popra & River on the Stary Sacz, the Leluchon section and the Tabor Rivers in Poland is given. It is concluded that the winds do not have the character of local winds caused by temperature gradients between mountain peaks and the depths of the valleys, but in the majority of cases arise as the result of atmospheric processes resulting from the general situation. R.J.F.

N82-25744# Federal Aviation Agency, Atlantic City, N.J.
NUMERICAL SIMULATION OF WIND FIELDS CALCULATED FROM ASSUMED MODE S DATA LINK INPUTS Final Report, Aug. 1979 - Jul. 1981
Anthony Carro and R. Craig Goff Jan. 1982 19 p refs (AD-A111185; FAA-CT-81-77; FAA-RD-81-100) Avail: NTIS HC A02/MF A01 CSCL 04/2

The future availability of the Mode S data link has suggested the possibility of using data collected by airplanes flying in the airport environment to reconstruct the atmospheric wind field in the airport area. These reconstructed fields would conceivably be of use to the metering and spacing personnel as well as to meteorologists and pilots flying through this particular atmospheric environment. An investigation was conducted to determine the feasibility of using a numerical method developed by J. T. Schaefer and C. A. Doswell III to produce an objectively analyzed wind field from sparse aircraft observations. A theoretical wind field resembling atmospheric conditions was used to compare the predicted field with the assumed theoretical field. Also investigated were (1) the degradation of the technique produced by decreasing the number of observations and (2) the influence of wind wavelength in the accuracy of the wind field prediction. GRA

N82-25745# Army Missile Command, Redstone Arsenal, Ala. Systems Simulation and Development Directorate.
AN ATMOSPHERIC TURBULENCE MODEL FOR THE DYNAMICALLY AIMED FREE-FLIGHT ROCKET (DAFR) ERROR ANALYSIS
Richard E. Dickson 1 Oct. 1981 28 p refs (AD-A111348; AD-E950196; DRSMI/RD-82-1-TR) Avail: NTIS HC A03/MF A01 CSCL 19/4

Previous error analysis of the Dynamically Aimed Free-flight Rocket (DAFR) utilized a linear model for the wind uncertainty. Also, the data used in the model had been filtered. This effort utilized a first-order Markov process to model the wind longitudinal turbulence uncertainty. The effect of terrain roughness is considered. Author (GRA)

N82-25746# Japan Atomic Energy Research Inst., Tokyo. Div. of Health Physics.
REPORT OF METEOROLOGICAL OBSERVATIONS ON THE SITE OF TOKAI RESEARCH ESTABLISHMENT FROM 1973 TO 1975
Kazuichi Obata, Hideo Kobayashi, Hiroshi Katagiri, and Morinobu Kokubu May 1980 130 p In JAPANESE; ENGLISH summary (JAERI-M-8856) Avail: NTIS (US Sales Only) HC A07/MF A01; DOE Depository Libraries

Statistics of meteorological observations from January 1973 to December 1975 on the site of Tokai Research Establishment are covered in monthly summaries. Daily and hourly mean wind speeds, temperatures, stability ratios, solar and net radiations, wind directions frequencies and atmospheric stabilities are presented. Author

N82-25747# Danish Meteorological Inst., Copenhagen.
ACCURACY OF POINT PRECIPITATION MEASUREMENTS
Peter Allerup and Henning Madsen 1979 84 p refs (DMI-Climatol-Papers-5; ISBN-87-7478-168-5) Avail: NTIS HC A05/MF A01

A statistical model which gives the ratio of the daily amounts of precipitation measured at ground level and at standard height, allowing for loss due to aerodynamic factors is presented. Analysis shows that evaporation error in measured results is not significant, but that wetting loss and aerodynamic error are. For aerodynamic error calculation, liquid and solid precipitation, and unsheltered and sheltered sites must be distinguished. Calculation tables which allow precipitation amounts to be corrected for single events or monthly sums are derived. Author (ESA)

N82-25552*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE EFFECT OF VARYING AMOUNTS OF SATELLITE DATA, OROGRAPHY AND DIABATIC PROCESSES ON THE NUMERICAL PREDICTION OF AN INTENSE CYCLONE
R. Atlas *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 7-10 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

N82-25553*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE RELATIVE CONTRIBUTIONS OF INCREASED RESOLUTION IN THE DATA ASSIMILATION AND IN THE FORECAST MODEL TO SATELLITE DATA IMPACT
R. Atlas, M. Ghil, and M. Halem *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 11-13 ref (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

N82-25556*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NUMERICAL PREDICTION OF THE LARGE SCALE TROPICAL FLOW
E. Kalnay, W. E. Baker, and J. Shukla *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 37-45 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

N82-25557*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERACTIVE PROCESSING OF SEASAT SCATTEROMETER DATA
R. Atlas, G. Cole, A. Pursch, and C. Long *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 49-51 (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

N82-25558*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PRELIMINARY EVALUATION OF THE FGGE SPECIAL EFFORT FOR DATA ENHANCEMENT
R. Atlas, A. Pursch, C. Long, G. Cole, and R. Rosenberg *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 52-60 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

N82-25559*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COMPARISON OF OBSERVED AND COMPUTED BRIGHTNESS TEMPERATURES FOR THE HIRS2 AND MSU SOUNDERS ON TIROS-N
J. Susskind, J. Rosenfield, and D. Reuter *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 61-67 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

N82-25561*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AN ANALYSIS OF INTERMITTENT UPDATING FOR THE SHALLOW WATER EQUATIONS
K. P. Bube *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 74-77 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

N82-25562*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APPLICATIONS OF ESTIMATION THEORY TO NUMERICAL WEATHER PREDICTION
S. Cohn, M. Ghil, and E. Isaacson *In its* Modeling and Simulation

Facility: Res. Rev., 1980 - 1981 refs Prepared in cooperation with New York Univ., N.Y. (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

N82-25564*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A VARIABLE VERTICAL RESOLUTION WEATHER MODEL WITH AN EXPLICITLY RESOLVED PLANETARY BOUNDARY LAYER
H. M. Helfand *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 82-83 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

N82-25568*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SHALLOW WATER EXPERIMENTS USING AN IMPROVED KREISS-OLIGER 2-4 SCHEME
L. L. Takacs and R. C. Balgovind *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 105-113 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

N82-25574*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CLIMATE MODEL POSTPROCESSING
J. Abeles, E. Pittarelli, and D. A. Randall *In its* Modeling Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 149-152 (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

N82-25577*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPATIAL AND TEMPORAL SCALES OF TIME-AVERAGED 700 MB HEIGHT ANOMALIES
D. Gutzler *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 163-169 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

N82-25579*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SEASONAL-CYCLE CLIMATE MODEL
L. Marx and D. A. Randall *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 185-187 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

N82-25581*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOME ASPECTS OF SOUTHWEST MONSOON AS SEEN IN A GLAS GCM SIMULATION
V. Satyan *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 195-197 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

N82-25582*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AN ANALYSIS OF THE CLOUD FIELDS SIMULATED BY THE GLAS CLIMATE MODEL
C.-H. Moeng and D. A. Randall *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 205-206A refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

N82-25583*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CLIMATOLOGY OF BLOCKING IN THE GLAS CLIMATE MODEL
J. Shukla, K. C. Mo, and M. Eaton *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 207-216 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

N82-25584*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STRUCTURE AND DYNAMICS OF MONSOON DEPRESSIONS: THE MONEX DEPRESSION (JULY 1979)
J. Shukla *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 217-222 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04A

N82-25585*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NUMERICAL PREDICTION OF THE MONSOON DEPRESSION OF 5-7 JULY, 1979
J. Shukla, R. Atlas, and W. E. Baker *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 223-230 refs Submitted for publication (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

N82-25586*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GLOBAL AND LOCAL FLUCTUATIONS OF WINTER AND SUMMER SIMULATIONS WITH THE GLAS CLIMATE MODEL
D. M. Straus and J. Shukla *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 231-236 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 04B

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N82-25748# Woods Hole Oceanographic Institution, Mass. Dept. of Geology and Geophysics.
COMPUTER-PROCESSED GEOPHYSICAL ATLAS OF DIGITAL DATA FOR THE EAST COAST MARGIN OF THE UNITED STATES FROM SURFACE AND SPACECRAFT DATA
Carl Bowin, Julie Milligan, and Karen Dunkle Dec. 1981 36 p refs Sponsored in part by Joint Oceanograph Inst., Inc.
(Contract N00014-82-C-0019)
(AD-A111388; WHOI-81-104) Avail: NTIS HC A03/MF A01 CSCL 08/10

This atlas comprises maps for the East Coast margin of the United States of free-air gravity anomaly, geoid anomaly, regional geoid anomaly, residual geoid anomaly, magnetic crustal anomaly, and bathymetry. Data from surface measurements, GEOS-III and MAGSAT Satellites, GEM-9 spherical harmonic coefficients, and SYNBAPS bathymetry profiling systems were utilized. Estimated error maps for the geoid data are not included because for the marine areas, these data are uniformly of very low error. The data are presented in three sets of maps of northern, central, and southern portions of the margin. Author (GRA)

N82-25749# Danish Meteorological Inst., Copenhagen.
THE ICE CONDITIONS IN THE GREENLAND WATERS, 1966
1981 128 p In ENGLISH and DANISH
(ISBN-87-7478-184-7) Avail: NTIS HC A07/MF A01

Maps indicating the size, distribution, and character of Greenland's coastal ice formations are presented. Twelve monthly compiled charts are given as well as all the original ice reconnaissance charts. Author (ESA)

N82-25750# Woods Hole Oceanographic Institution, Mass. Dept. of Physical Oceanography.
A COMPILATION OF MOORED INSTRUMENT DATA AND ASSOCIATED HYDROGRAPHIC OBSERVATIONS. VOLUME 28: (POLYMODE LOCAL DYNAMICS EXPERIMENT, 1978-1979)
Carol A. Mills, Susan A. Tarbell, and Richard E. Payne Aug. 1981 58 p refs 28 Vol.
(Grant NSF OCE-77-19403)
(PB82-139411; WHOI-81-73-Vol-28) Avail: NTIS HC A04/MF A01 CSCL 08C

Summaries are presented of ocean current velocities,

pressures and temperatures recorded by instruments in moored arrays. The arrays comprised 28 current meters and 15 temperature-pressure recorders on 9 moorings deployed for 15 months in the vicinty of 31 degrees N, 69 degrees 30 min W from April 1978 to July 1979. Summaries of the ten hydrographic stations made on the array recovery cruise are also presented. Author (GRA)

N82-25578*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MID-LATITUDE WIND FORCED OCEAN CIRCULATION STUDIES
D. E. Harrison *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 170-175 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 08J

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N82-25751*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
STS-2 MEDICAL REPORT
Sam L. Pool, ed., Philip C. Johnson, Jr., ed., and John A. Mason, ed. May 1982 31 p refs
(NASA-TM-58245; S-514; NAS 1.15:58245) Avail: NTIS HC A03/MF A01 CSCL 06C

All medially related activities of the Space Transportation System 2 flight are described, ranging from preflight to postflight. Several medical problems occured during the flight. Their was marginal operation on-board potable water system caused by a malfunctioning fuel cell. Work and rest cycles by the crew were altered to maximize the scientific data acquisition. Inadequate time was allocated for food preparation and consumption. There was low water intake by the crew because of the water shortage. R.J.F.

N82-25752# Central Research Inst. for Physics, Budapest (Hungary). Central Research Inst. for Physics.
ELEMENTAL ANALYSIS OF SAMPLES OF BIOLOGICAL ORIGIN RELATIVE TO THEIR PROTEIN CONTENT BY MEANS OF CHARGED PARTICLE BOMBARDMENT
Z. Szoekefalvi-Nagy, I. Demeter, L. Varga, K. Hollos-Nagy, and L. Keszthelyi Apr. 1981 26 p refs In ENGLISH; HUNGARIAN summary Submitted for publication
(KFKI-1981-26; ISSN-0368-5330; ISBN-963-371-803-1) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The particle excited X-ray emission (PIXE) and the (14)N(d,p)(15)N nuclear reaction was combined for simultaneous elemental composition and nitrogen content determination in biological samples. Using the correlation between nitrogen and protein content the elemental composition is related to the protein content of the sample. The principles and main characteristics of the method are described and illustrative applications are also given. DOE

N82-25753# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
THE EFFECTS OF SOME DRUGS ON THE SURVIVAL OF RATS IN VARIOUS STAGES OF HEMORRHAGIC SHOCK
M. Wijnans and P. vanEck Jun. 1981 30 p refs In DUTCH; ENGLISH summary
(Contract A76/K/095)
(MBL-1981-7; TDCK-75204) Avail: NTIS HC A03/MF A01

Possible treatments of rats in hemorrhagic shock were studied in order to compare simple shock treatments techniques that can be applied by nonmedical personnel. Three procedures were followed in order to obtain three states of shock: (1) bleeding until a certain low blood pressure resulted, producing nearly 100% death of the rats (2) similar bleeding followed by reinfusion of the shed blood after a certain interval, resulting in nearly 100% survival, and (3) a Wiggers type of transfusion resistant shock, causing 80% mortality within 24 hr in spite of the reinfusion of all the shed blood. When the required state of shock was obtained, various treatments were immediately applied. The administration of a saline solution in the stomach following procedure (1) has little or no effect on the survival time, but when injected intraarterially it is very effective. Pharmacological agents (dramine, octapressine, dexamethasone, atropine) have either no effect or make the situation worse. Author (ESA)

N82-25754# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 16, NO. 2, MARCH - APRIL 1982
14 May 1982 152 p refs Transl. into ENGLISH of Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982
(JPRS-80822) Avail: NTIS HC A08/MF A01

Nutritional and dietic studies in space flight feeding are highlighted. Mineral content in space rations was studied with respect to prevention of ill effects due to hypokinesia. The diets of the crews of the Salyut Space Station were examined for nutritional benefits. Other topics covered include: bacterial activity in weightlessness; the concentration of amino acids in various muscles during prolonged space flight; the adaptivity of man to stressful conditions in the spacecraft cabin; and the functional stability of the cardiovascular and digestive systems during and after long duration space flight. For individual titles, see N82-25755 through N82-25778.

N82-25755# Joint Publications Research Service, Arlington, Va.
THIRD DECADE OF SPACE BIOLOGY
O. G. Gazenko and G. P. Parfenov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 1-10 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 4-10 (For primary document see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

The major results of experiments on microorganisms, plants and animals flown onboard space vehicles during the past two decades were reviewed. To explain the experimental findings, it is hypothesized that living beings develop an indirect adaptation to gravity effects which has a bearing only on the phylogenetic process. T.M.

N82-25756# Joint Publications Research Service, Arlington, Va.
DIET OF CREW IN SALYUT-6 ORBITAL STATION **c54**
V. P. Bychkov, A. S. Ushakov, S. Kalandarov, M. V. Markaryan, Ye. A. Sedova, A. K. Kivuk, and O. S. Khokhlova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 11-15 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 10-13 (For primary document see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

The nutrition factor in life support systems (LSS) for spacecraft crews consists of the food allowance and equipment to store foods, preparation and intake of food. The main purpose of this factor is to keep a level of vital functions in cosmonauts that would assure the successful implementation of flight programs. The distinctions of outfitting nutrition elements depend on both the duration of space missions and principles of construction of LSS as a whole. The space diets used in flight of five permanent Salyut-6 crews were reviewed. Cosmonauts complained that sterile canned foods became distasteful; due to this, a space diet consisting of 65% freeze-dried foodstuffs was developed and tested. T.M.

N82-25757# Joint Publications Research Service, Arlington, Va.
EFFECT OF 48-DAY FLIGHT ON BLOOD AMINO ACID CONTENT IN THE CREW OF SALYUT-5 **c52**
I. G. Popov and A. A. Latskevich *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 16-22 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 14-19 (For primary document see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

The study of the content of 17 amino acids in plasma of the crewmembers pre- and postflight demonstrated their

time-course changes. This concerns mostly cystine and methionine. It is recommended to improve the cystine and methionine content of space diets and to modify technological procedure of food preservation. T.M.

N82-25758# Joint Publications Research Service, Arlington, Va.

STATE OF DIGESTIVE SYSTEM FOLLOWING LONG-TERM SPACE FLIGHTS c52

K. V. Smironov, G. D. Syrykh, V. I. Legenkov, L. G. Goland-Ruvinova, I. L. Medkova, and L. I. Voronin *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 23-28 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 19-22 (For primary document see N82-25754 16-51)

Avail: NTIS HC A08/MF A01

In the crewmembers of four Salyut-6 long-term flights, enzyme excretory function of the gastro-intestinal tract was investigated. These studies included: gastric proenzyme, pepsinogen, and pancreatic enzymes, amylase and lipase, in blood and urine, trypsin in blood, intestinal enzymes, invertase and glycyl-L-leucine dipeptidase in feces, and lipids in feces. The results obtained demonstrated a correlation between changes in enzyme excretion and space flight duration and profile. After the 140- and 175-day flight the most marked changes in the digestive organs were seen; they manifested as simultaneous increase in secretory function of the stomach and the pancrease. However, after the 185-day flight, in which advanced countermeasures were used, the above changes were less distinct. Author

N82-25759# Joint Publications Research Service, Arlington, Va.

BIOLOGICAL VALUE AND SHELF LIFE OF CULTURED DAIRY PRODUCTS IN THE DIET OF COSMONAUTS c54

I. A. Radayeva, G. A. Rossikhina, V. A. Usacheva, G. S. Poyarkova, and S. P. Shulkina *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 29-33 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 23-26 (For primary document see N82-25754 16-51)

Avail: NTIS HC A08/MF A01

Freeze-dried culture milk products--yoghurt with sugar, yoghurt with fruits and berries, acidophilic paste--were examined in the course of storage. The optimal time of their storage was determined, and high biological value of protein and good viability of lactic acid microflora were demonstrated. These products were recommended to be incorporated into space diets. Author

N82-25760# Joint Publications Research Service, Arlington, Va.

EFFECT OF HYPOKINESIA ON MAN'S NUTRITIONAL STATUS c52

V. P. Bychkov, V. N. Gryaznova, S. Kalandarov, A. G. Kasatkina, V. A. Korshunova, M. V. Markaryan, A. K. Sivuk, and O. S. Khokhlova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 34-39 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 26-29 (For primary document see N82-25754 16-51)

Avail: NTIS HC A08/MF A01

In three series of experiments of 120, 49 and 180 days in duration 36 test subjects were exposed to clinostatic and antiorthostatic hypokinesia. Human requirements for various nutrients were defined under hypokinetic conditions. It was demonstrated that during bed rest exercises together with adequate nutrition and after bed rest certain nutrients can serve as efficient countermeasures against metabolic changes. Author

N82-25761# Joint Publications Research Service, Arlington, Va.

CLINICOPHYSIOLOGICAL CHANGES IN MAN DURING LONG-TERM ANTIORTHOSTATIC HYPOKINESIA c52

T. N. Krupina, A. Ya. Tizul, M. P. Kuzmin, and N. I. Tsyganova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 40-45 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 29-34 (For primary document see N82-25754 16-51)

Avail: NTIS HC A08/MF A01

Using clinical-physiological and biochemical methods, adaptation to prolonged (182 days) head-down tilting (-4.5°) was investigated. It was found that man exposed to hypokinesia for a month or longer, with countermeasures lacking, showed polymorphic clinical-physiological and biochemical disorders accompanied by a decline of his adaptive capabilities. This may aggravate further adapatation and readaptation processes. Author

N82-25762# Joint Publications Research Service, Arlington, Va.

EFFECTS OF 1 ALPHA-HYDROXYCHOLECALCIFEROL AND DIFFERENT AMOUNTS OF PHOSPHORUS IN FOOD ALLOWANCE ON SOME PARAMETERS OF PHOSPHORUS AND CALCIUM METABOLISM IN HYPOKINETIC RATS

N. V. Blazheyevich, V. B. Spirichev, A. S. Ushakov, M. S. Belakovskiy, A. L. Pozdnyakov, and I. N. Sergeyev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 46-54 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 34-40 (For primary document see N82-25754 16-51)

Avail: NTIS HC A08/MF A01

The exposure of rats to hypokinesia and a phosphorus-enriched diet (Ca:P = 1:3) was accompanied by hypocalciemia, hyperphosphatemia, calcium losses from bones and formation of calcificates in the kidneys. The decrease of the phosphorus content in the diet (Ca:P = 1:0.5-1:1) prevented these disorders. The administration of 1 OHD3 at a dose of 0.025 micrograms/day arrested hypokinesia-associated hypocalciemia and bone changes. The administration of 1 alpha OHD3 together with a high phosphorus consumption enhanced nephrolithiasis and induced aortal mediacalcinosis in hypokinetic rats. These data indicate that phosphorous consumption should be reduced in order to prevent disorders in phosphorus-calcium metabolism during hypokinesia. They also suggest that administration of 1 alpha OHD3 may be hazardous in the case of excessive phosphorus consumption. Author

N82-25763# Joint Publications Research Service, Arlington, Va.

INFLUENCE OF LEVEL OF MINERALIZATION OF DESALINATED, HIGH QUALITY WATER OF THE HYDROCARBONATE CLASS ON FUNCTIONAL STATE OF MALE WHITE RAT GONADS

O. I. Balashov, A. B. Sysoyev, and A. V. Rodnikov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 55-61 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 40-45 (For primary document see N82-25754 16-51)

Avail: NTIS HC A08/MF A01

As known, the salt content in the potable water has a gonadotropic effect, the level of which being in agreement with the traditional norm. However, within the normal limits one can distinguish better or worse functional manifestations. It is shown that statistical treatment of the data, using the Student t-test, is of low efficiency because it neglects the ratio between groups. Of greater efficiency is the statistical treatment based on the domineering order. Proceeding from the theoretical speculations and experimental results, potable water with the mineral content of 250 mg/lambda should be regarded as optimal. Author

N82-25764# Joint Publications Research Service, Arlington, Va.

SOME PHYSIOLOGICAL AND BIOCHEMICAL FEATURES OF CELLS OF CARROT GALL DEVELOPED IN WEIGHTLESSNESS

M. G. Tairbekov, L. A. Voronkov, and N. A. Guzhova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 62-67 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 45-48 (For primary document see N82-25754 16-51)

Avail: NTIS HC A08/MF A01

The results of experiments with the carrot tissues infected with Agrobacterium tumefaciens flown onboard the biosatellite Cosmos-1129 are presented. Postflight, the respiratory activity of tumor cells was determined and K(+) and Na(+) permeability of cell membranes was measured. The resulting data give evidence

that in weightlessness the development of the carrot gall tumor is accompanied by changes in the above physiological and biochemical parameters. The changes are, however, within the physiological limits, leading to no pathologies of the whole cell. T.M.

N82-25765# Joint Publications Research Service, Arlington, Va.

FUNCTIONAL STATE OF RAT GASTROINTESTINAL TRACT ORGANS FOLLOWING FLIGHT IN COSMOS-1129 BIOSATELLITE

K. V. Smironov, L. G. Goland-Ruvinova, N. P. Goncharova, O. V. Zhiznevskaya, I. L. Medkova, N. M. Nikolayeva, R. A. Pechenkina, and A. N. Petrusenko *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 62-73 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 68-73 (For primary document see N82-25754 16-51)

Avail: NTIS HC A08/MF A01

The enzyme-excretory and motor functions of the gastrointestinal tract of rats flown for 18.5 days onboard the biosatellite Cosmos-1129 were studied. Immediately postflight, the pepsin synthesis decreased and the dipeptide parietal hydrolysis increased. At R+6, the activity of the enzymes responsible for the cavitary and parietal hydrolysis of lipids significantly grew and that of the enzymes involved in protein hydrolysis fell. At R+30, the carbohydrate hydrolysis was inhibited and the activity of lipolytic enzymes enhanced markedly. The amplitude and rhythm of stomach biopotentials were disbalanced. The so-called immobilization stress of intact rats brought about activation of lipase, monoglyceridyl lipase, monoglyceridyl lipase, dipeptidase and inhibition of amylase and invertase. The immobilization exposure of flight rats caused inhibition of the membrane hydrolysis of proteins and carbohydrates and lack of the pancreatic reaction. Author

N82-25766# Joint Publications Research Service, Arlington, Va.

AMINO ACIDS OF FEMORAL QUADRICEPS OF RATS FOLLOWING FLIGHT ABOARD THE COSMOS-936 BIOSATELLITE

T. F. Vlasova, Ye. B. Miroshnikova, V. V. Polyakov, and T. P. Murugova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 74-78 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 53-56 (For primary document see N82-25754 16-51)

Avail: NTIS HC A08/MF A01

The amino acid composition of the muscle of rats flown onboard the biosatellite and exposed to the ground-based synchronous control experiment was studied. The weightless rats showed changes in the amino acid concentration in the quadriceps muscle. The centrifuged flight and synchronous rats displayed an accumulation of free amino acids in the above muscle. T.M.

N82-25767# Joint Publications Research Service, Arlington, Va.

PLASMA AND TISSUE LIPIDS OF RATS FOLLOWING FLIGHT ABOARD COSMOS-936 BIOSATELLITE

J. Ahlers, R. A. Tigranyan, and M. Praslicka *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 79-82 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 56-58 (For primary document see N82-25754 16-51)

Avail: NTIS HC A08/MF A01

The content of triglycerides, total phospholipids and nonesterified fatty acids was measured in plasma and tissues of rats flown for 18.5 days on Cosmos-936 in the weightless and centrifuged state. The weightlessness exposure increased lipid fractions in plasma and tissues, and artificial gravity produced a beneficial effect. Author

N82-25768# Joint Publications Research Service, Arlington, Va.

PLASMA AND TISSUE LIPIDS OF RATS FOLLOWING FLIGHT ABOARD THE COSMOS-1129 BIOSATELLITE

J. Ahlers, R. A. Tigranyan, I. Djatelinka, B. Schmeida, M. Toropila, and M. Praslicka *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 83-86 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 58-61 (For primary document see N82-25754 16-51)

Avail: NTIS HC A08/MF A01

Concentrations of triglycerides, total cholesterol, lipid phosphorus and nonesterified fatty acids were measured in blood plasma, liver, thymus, bone marrow and adipose tissues of rats flown for 18.5 days onboard the biosatellite Cosmos-1129. This exposure was accompanied by increases in lipomobilization, content of total cholesterol and lipid phosphorus in plasma, and triglycerides in the thymus and bone marrow. The postflight exposure to repeated stresses demonstrated changes in the lipid content in all animal groups, especially in flight rats. Author

N82-25769# Joint Publications Research Service, Arlington, Va.

MINERAL PHASE AND PROTEIN MATRIX OF RAT OSSEOUS TISSUE FOLLOWING FLIGHT ABOARD THE COSMOS-1129 BIOSATELLITE

A. A. Prokhonchukov, K. S. Kesyatnichenko, R. A. Tigranyan, and N. A. Komisarova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 87-92 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 61-64 (For primary document see N82-25754 16-51)

Avail: NTIS HC A08/MF A01

The major parameters of the mineral component and protein matrix of bones were investigated in 30 rats flown onboard Cosmos-1129. Postflight, the content of calcium decreased by 7.8%, that of phosphorus diminished by 11.8%, the Ca/P ratio increased by 5.9%, the content of collagen diminished by 14.7% and that of non-collagenous proteins by 45.7% and the content of sialic and hexuronic acids increased by 36.2% and 14.6%, respectively, as compared to the vivarium control. The role of EDTA- and HCl-protein extracts, soluble and poorly soluble calcium fractions, protein-Ca-phosphate complex, sialic and hexuronic acids n the mechanism of calcium binding by the bone organic matrix are discussed. Author

N82-25770# Joint Publications Research Service, Arlington, Va.

NEUROPHYSIOLOGICAL CHARACTERISTICS OF SENSORIMOTOR CORTEX OF RATS SUBMITTED TO EARLY MOTOR DEPRIVATION AND CONDITIONING

I. A. Shimko *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 93-101 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 64-70 (For primary document see N82-25754 16-51)

Avail: NTIS HC A08/MF A01

Young rats, beginning with the age of 1 month, were kept in small size cages for 3 months, i.e., were exposed to 3-month motor deprivation. This exposure caused a modulating effect of a diminished activity of neuronal populations in the sensorimotor cortex which manifested as a prolongation of the latent periods of primary responses and recovery cycles of excitation of the neuronal populations generating the responses. The differences in the opposite changes in the sensorimotor cortex of the young animals that developed following prolonged deprivation and training of similar duration were seen in the parameters of excitation recovery cycles rather than in the latent periods. Both early motor deprivation and training did not influence the heterochronic development, emergence and subsequent attainment of the maximum amplitude of components of the testing primary response in the process of a gradual increase of the stimulus-to-stimulus interval. Author

N82-25771# Joint Publications Research Service, Arlington, Va.

HYGIENIC EVALUATION OF NEW TYPES OF RUBBER TO BE USED IN WATER SUPPLY SYSTEMS EXPOSED TO HIGH TEMPERATURES AND ACTIVE CHEMICALS **c27**

N. I. Omelyanets, V. I. Lashkareva, N. N. Shabatura, and I. S. Kucherov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 102-107 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 70-73 (For primary document

see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

The results of hygienic testing of new rubbers, IRP-2043 and IRP-1136, are presented. The rubber IRP-2043 does not change the quality of the water it contacts with. Water extracts of this rubber do not produce a toxic effect on homoiothermal animals. This rubber can therefore be recommended to be used in potable water supply systems. The rubber IRP-1136, when contacting with dechlorinated tap water, alters its organoleptic and physicochemical properties. This rubber cannot be recommended for water supply systems. After a prolonged (18 months) exposure to the condensate of degradation products of the agent 0-30, urine conserving agent and a mixture of urine and the conserving agent the rubbers IRP-2043 and IRP-1136 do not alter physicochemical and bacteriological properties of water or disturb physiological functions of homoiothermal animals. Having this in view, both rubbers can be used in water supply systems functioning at high temperatures and under the influence of active chemicals. Author

N82-25772# Joint Publications Research Service, Arlington, Va.

AEROSOL POLLUTION OF AIRTIGHT HABITATS c45

B. V. Anisimov, T. I. Golubeva, G. N. Kuzmenko, and V. P. Savina *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 108-112 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 73-76 (For primary document see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

Man's contribution to the formation of aerosol particles in manned enclosures is discussed. The data obtained in prolonged simulation studies suggest that man is the major source of aerosol contamination. The aerosol concentration and disperse composition are found to depend on the free volume per man. For the first time data on the rate of dust formation in manned enclosures are presented. Author

N82-25773# Joint Publications Research Service, Arlington, Va.

MAN'S ADAPTIVE REACTIONS TO ACOUSTIC PARAMETERS OF ISOLATED HABITATS c52

G. A. Manovtsev, V. A. Korsakov, G. I. Odinokov, and V. A. Stepanov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 113-120 refs Transl. into ENGLISH from Kosm. Biol. Viakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 76-81 (For primary document see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

Noise plays an important part in the set of factors that characterize man's distinctive living conditions in pressurized chambers. The study of acceptability of noise levels, subjective evaluation of the acoustic environment by the test subjects, and examination of their cardiovascular function demonstrated the development of adaptive reactions to the noise effects which were accompanied by a certain tension in the cardiovascular system. Author

N82-25774# Joint Publications Research Service, Arlington, Va.

AGE-RELATED DISTINCTIONS OF ECHOCARDIOGRAPHIC PARAMETERS OF HEALTHY MAN c52

A. M. Babin *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 121-124 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 82-84 (For primary document see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

Certain parameters of intracardiac hemodynamics and myocardial contractility of healthy men were examined by echocardiography. Age-related variations of these parameters were seen in representatives of different age groups. It is emphasized that echocardiography may find a wider application in space medicine. Author

N82-25775# Joint Publications Research Service, Arlington, Va.

ROLE OF POLARIZATION AND RESONANCE IN ASSESSING THE BIOLOGICAL EFFECTS OF ELECTROMAGNETIC RADIATION c52

A. A. Galkin *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 125-130 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 84-87 (For primary document see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

The dosimetric concept of measurements of electromagnetic radiations (EMR) during irradiation of biological objects can be realized by methods of mathematical modeling of EMR interactions with biological objects, which can be represented as an image of the human body as a uniform ellipsoid of revolution. The efficient surface of EMR absorption for the models shows a marked resonance dependence on the radiation frequency. The ratio of the largest to the smallest axes of the ellipsoid of revolution can be used as resonance criterion. Besides, radiation polarization needs to be taken into consideration. The frequency dependence of the efficient absorption surface for three major types of radiation polarization is discussed. An applicability of the calculation method to the evaluation of the EMR absorbed dose rate is demonstrated. Author

N82-25776# Joint Publications Research Service, Arlington, Va.

SYMPATHOADRENAL SYSTEM OF COSMONAUTS FOLLOWING 7-DAY FLIGHTS c52

N. A. Davydova and R. A. Tigranyan *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 131-136 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 88-91 (For primary document see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

The sympathoadrenal system (SAS) is an important element of neurohumoral regulation, and for this reason it is particularly important to study the activity of its hormonal and mediatory elements, which is an indicator of stress reactions, during space flights when the human body is exposed to extreme factors, and the success of the flight depends largely on man's capacity to adjust to these conditions. A number of researchers examined SAS activity in cosmonauts following flights of various duration (1-4); however, the results do not reflect adequately the changes occurring in the SAS due to the fact that only some aspects of catecholamine (CA) metabolism were studied. Out objective here was to determine whether a stress reaction could occur following 7-day space flights by using the complete spectrum of parameters characterizing SAS activity. Author

N82-25777# Joint Publications Research Service, Arlington, Va.

VENOUS PRESSURE AS AN INDICATOR OF CIRCULATING BLOOD VOLUME c52

A. S. Nekhayev, V. A. Degtyarev, and V. S. Bednenko *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 137-140 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 91-92 (For primary document see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

The reduction in circulating blood volume (CBV) due to fluid loss in weightlessness can be viewed as one of the defense mechanisms that prevents development of hypertension and hypervolemia in the intrathoracic and cranial parts of the circulatory system. However, upon returning to Earth's gravity, this change in CBV could be the cause of decline in orthostatic stability of cosmonauts. For this reason, it is necessary to monitor CBV dynamics in the postflight period, particularly with correction of fluid-electrolyte balance. The possibility of indirect evaluation of CBV, in particular, by means of the indicator of venous pressure in the system of jugular veins measured indirectly is explored. Author

N82-25778# Joint Publications Research Service, Arlington, Va.

ELECTROMETRIC CHARACTERISTICS OF MAN'S GASTROLINGUAL REFLEX c52

I. Ya. Yakovleva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1

into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 92-93 (For primary document see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

Results revealed that exposure of healthy man to conditions simulating the period of acute adaptation to weightlessness is associated with impaired function of the taste organ and is characterized by a change in the gastrolingual reflex electrometry of the taste analyzer was used to characterize man's gastrolingual reflex in the presence of usual gravity and with alteration of Earth's gravity. L.F.M.

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N82-25779*# SRI International Corp., Menlo Park, Calif.
PURKINJE IMAGE EYETRACKING: A MARKET SURVEY Final Contractor Report
Lo. F. Christy Mar. 1979 144 p refs
(Contract NAS2-9846)
(NASA-CR-166338; NAS 1.26:166338) Avail: NTIS HC A07/MF A01 CSCL 20F

The Purkinje image eyetracking system was analyzed to determine the marketability of the system. The eyetracking system is a synthesis of two separate instruments, the optometer that measures the refractive power of the eye and the dual Purkinje image eyetracker that measures the direction of the visual axis. E.A.K.

N82-25780# California Univ., Irvine, Dayton, Ohio.
TOXIC HAZARDS RESEARCH UNIT Annual Technical Report, Jun. 1980 - May 1981
J. D. MacEwen and E. H. Vernot Wright-Patterson AFB, Ohio AMRL Dec. 1981 139 p refs
(Contract F33615-80-C-0512; AF Proj. 6302; MF58524025)
(AD-A110587; AFAMRL-TR-81-126) Avail: NTIS HC A07/MF A01 CSCL 06/20

Chronic toxicity or oncogenic studies were carried out with methylcyclohexane, purified 1,1-dimethylhydrazine, Otto Fuel II, JP-10, RJ-5, and JP-4. A subchronic inhalation study was conducted with shale derived JP-5 and Decalin fuels. Acute toxicity studies were conducted on a variety of chemical agents used by the Air Force and Navy. GRA

N82-25781# Lund Univ. (Sweden). Radiofysika Inst.
IN VIVO X-RAY FLUORESCENCE ANALYSIS FOR MEDICAL DIAGNOSIS. A NON-INVASINE METHOD FOR QUANTITATIVE DETERMINATION OF KIDNEY FUNCTION AFTER RADIOGRAPHIC EXAMINATIONS WITH IODINATED CONTRAST MEDIA Ph.D. Thesis
Thomas Groenberg May 1981 128 p refs
(LUNFD6/NFRA-1013/1-21/(1981);
LUMEDW/MERI-1013/1-21/(1981)) Avail: NTIS (US Sales Only) HC A07/MF A01; DOE Depository Libraries

A Monte Carlo code was constructed and used to simulate the energy distribution of scattered photons obtained in various in vivo X-ray fluorescence measurements. The structure of this distribution was investigated and discussed. Studies of the response function of the Ge-detector used made it possible to convert the calculated scatter spectra to pulse height distributions. These studies are valuable tools in designing in vivo X-ray fluorescence measurements. In vivo X-ray fluorescence measurements were used for quantitative non invasive measurements of the concentration of iodine containing contrast media in rabbits without the use of blood or urine sampling. The biological half life of the contrast medium in the soft tissue part of the nose (measured in vivo) was similar to that in serum (measured in vitro) when determined in the period 2 to 4 hours after injection. The method can be used for clinical evaluation of kidney function. DOE

N82-25782# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
SURVEY OF THE EXPERIMENTAL SHOCK RESEARCH PERFORMED AT THE MEDICAL BIOLOGICAL LABORATORY TNO AND AT THE PHARMACOLOGICAL LABORATORY, UNIVERSITY OF AMSTERDAM
C. vanderMeer Aug. 1981 19 p refs In DUTCH; ENGLISH summary Sponsored in cooperation with Amsterdam Univ.
(Contract A76/K/095)
(MBL-1981-9; TDCK-75515) Avail: NTIS HC A02/MF A01

Experimental research on shock is surveyed. This research is urgently needed since the optimal treatment of shock patients is still a matter of discussion, while the occurrence of irreversible shock is still a serious problem. The research is partly aimed at a study of shock models, concerning different aspects of irreversible shock, i.e., tourniquet shock, hemorrhagic shock, endotoxin shock and intestinal ischemia shock. A model of shock kidney is studied as well as possibilities of emergency treatment to prevent the occurrence of shock and some aspects of diver's disease. The evaluation of certain forms of shock treatment is being initiated. Author (ESA)

N82-25783# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Afd. Audiologie.
THE EFFECT OF NOISE-INDUCED HEARING LOSS ON THE ABILITY TO UNDERSTAND SPEECH
J. A. P. M. deLaat and G. F. Smoorenburg Jul. 1981 17 p refs In DUTCH; ENGLISH summary
(Contract A76/K/105)
(IZF-1981-11; TDCK-75525) Avail: NTIS HC A02/MF A01

Speech reception thresholds (50% sentence intelligibility) were measured for 22 persons (44 ears) with noise induced hearing loss (NIHL) and for 7 persons with normal hearing. The speech reception thresholds were measured in quiet and also in ambient noise at levels of 25, 40, 55, and 70 dbA. In ambient noise, an average speech reception threshold for the NIHL group was about 4 db higher than the average threshold for normals. The 4 db increase of signal to noise ratio required to keep the sentence score at 50% for the NIHL group can also be expressed in a loss of sentence score when the sentences are presented at the same signal to noise ratio to normals and NIHL group. For a signal to noise ratio at which normals just score 100%, the score for the NIHL group is only 33%. The hearing loss criterion of 25 db averaged across the losses at 500, 1000 and 2000 Hz implies a severe handicap to understand speech, in particular in noisy environments. In view of this handicap, hearing loss in excess of 15 db averaged across 1000, 2000 and 3000 Hz can not be tolerated. Author (ESA)

N82-25784# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Afd. Audiologie.
RECOMMENDATIONS TO AVOID HEARING DAMAGE DURING FIRING OF THE M198, FH70, M71 AND FH77 TOWED HORWITZERS
A. M. Mimpen and G. F. Smoorenburg Jul. 1981 22 p In DUTCH; ENGLISH summary
(Contract A79/KL/086)
(IZF-1981-13; TDCK-75526) Avail: NTIS HC A02/MF A01

Peak sound pressure levels were measured at several distances around the muzzles of four types of towed howitzers fired with different charges. For small charges, peak levels were determined also at the ear of the gunner and the other crew positions. The effective duration of each sound impulse was determined. On the basis of peak level and duration, the preferred number and the maximum number of firings not to be exceeded were calculated for three kinds of hearing protection in order to limit the risk of a hearing loss of 15 db or more averaged across 1.2 and 3 kHz to 5% (preferred value) or 10% (maximum). For some howitzers the A-weighted impulse level was measured and can be used to estimate annoyance from firing noise. Author (ESA)

N82-25785# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Afd. Audiologie.
STATISTICAL EXAMINATION OF HEARING LOSS DUE TO GUNFIRE NOISE AND INDUSTRIAL NOISE: CONSEQUENCES FOR SCREENING AUDIOMETRY WITH FIXED FREQUENCIES
J. A. P. M. deLaat and G. F. Smoorenburg Sep. 1981 22 p refs In DUTCH; ENGLISH summary
(Contract A78/K/095)

(IZF-1981-20; TDCK-75531) Avail: NTIS HC A02/MF A01

The reliability of screening audiometry with fixed frequencies as compared to screening audiometry with a continuously sweeping frequency was investigated. The investigation was based on two data sets: 528 audiograms of 278 persons exposed to gunfire noise and 1306 audiograms of 679 persons exposed to industrial noise. Looking for gunfire noise dips of 30 db or greater at any frequency, the highest score is obtained with a screening frequency of 6300 Hz and a screening level of 25 db. The best choice for gunfire noise dips is 5000 Hz and 6300 Hz. For dips due to industrial noise, the best single screening frequency is 4000 Hz. For two screening frequencies the best choice is 4000 and 8000 Hz. The data sets show that two to four screening frequencies are sufficient and that screening levels should be chosen 5 to 10 db below the target level. Author (ESA)

N82-25757# Joint Publications Research Service, Arlington, Va.

EFFECT OF 48-DAY FLIGHT ON BLOOD AMINO ACID CONTENT IN THE CREW OF SALYUT-5

I. G. Popov and A. A. Latskevich *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 16-22 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 14-19 (For primary document see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

N82-25758# Joint Publications Research Service, Arlington, Va.

STATE OF DIGESTIVE SYSTEM FOLLOWING LONG-TERM SPACE FLIGHTS

K. V. Smironov, G. D. Syrykh, V. I. Legenkov, L. G. Goland-Ruvinova, I. L. Medkova, and L. I. Voronin *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 23-28 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 19-22 (For primary document see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

N82-25760# Joint Publications Research Service, Arlington, Va.

EFFECT OF HYPOKINESIA ON MAN'S NUTRITIONAL STATUS

V. P. Bychkov, V. N. Gryaznova, S. Kalandarov, A. G. Kasatkina, V. A. Korshunova, M. V. Markaryan, A. K. Sivuk, and O. S. Khokhlova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 34-39 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 26-29 (For primary document see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

N82-25761# Joint Publications Research Service, Arlington, Va.

CLINICOPHYSIOLOGICAL CHANGES IN MAN DURING LONG-TERM ANTIORTHOSTATIC HYPOKINESIA

T. N. Krupina, A. Ya. Tizul, M. P. Kuzmin, and N. I. Tsyganova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 40-45 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 29-34 (For primary document see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

N82-25773# Joint Publications Research Service, Arlington, Va.

MAN'S ADAPTIVE REACTIONS TO ACOUSTIC PARAMETERS OF ISOLATED HABITATS

G. A. Manovtsev, V. A. Korsakov, G. I. Odinokov, and V. A. Stepanov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 113-120 refs Transl. into ENGLISH from Kosm. Biol. Viakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 76-81 (For primary document see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

N82-25774# Joint Publications Research Service, Arlington, Va.

AGE-RELATED DISTINCTIONS OF ECHOCARDIOGRAPHIC PARAMETERS OF HEALTHY MAN

A. M. Babin *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 121-124 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 82-84 (For primary document see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

N82-25775# Joint Publications Research Service, Arlington, Va.

ROLE OF POLARIZATION AND RESONANCE IN ASSESSING THE BIOLOGICAL EFFECTS OF ELECTROMAGNETIC RADIATION

A. A. Galkin *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 125-130 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 84-87 (For primary document see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

N82-25776# Joint Publications Research Service, Arlington, Va.

SYMPATHOADRENAL SYSTEM OF COSMONAUTS FOLLOWING 7-DAY FLIGHTS

N. A. Davydova and R. A. Tigranyan *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 131-136 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 88-91 (For primary document see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

N82-25777# Joint Publications Research Service, Arlington, Va.

VENOUS PRESSURE AS AN INDICATOR OF CIRCULATING BLOOD VOLUME

A. S. Nekhayev, V. A. Degtyarev, and V. S. Bednenko *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 137-140 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 91-92 (For primary document see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

N82-25778# Joint Publications Research Service, Arlington, Va.

ELECTROMETRIC CHARACTERISTICS OF MAN'S GASTROLINGUAL REFLEX

I. Ya. Yakovleva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 141-143 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 92-93 (For primary document see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N82-25786# Naval Training Equipment Center, Orlando, Fla.

PERFORMANCE MEASUREMENT AND NAVY'S TACTICAL AIRCREW TRAINING SYSTEM Final Technical Report, Mar. - Apr. 1981

Gerald R. Stoffer Sep. 1981 39 p refs
(AD-A110669; NAVTRAEQUIPC-IH-333) Avail: NTIS HC A03/MF A01 CSCL 05/9

The development and use of the Tactical Aircrew Training System (TACTS) as a means for training advanced air combat skills are described. Pilot performance measurement capabilities of the TACTS are reviewed in terms of their value for pilot selection, aircrew training, assessment, and simulator design. Several approaches and methods used to conceptualize and measure air combat maneuvering (ACM) performance are presented. Limitations in existing TACTS performance measure-

ment capabilities are illustrated in terms of several psychometric, training, and TACTS operational user feasibility requirements for a system of performance measurement. It is concluded that while the existing TACTS represents a highly advanced aviation engineering technology that can provide extremely valuable training, that same technology has largely ignored the functional requirements for a system of human performance measurement. Improvements in the TACTS performance measurement capabilities will improve its training value even further. Author (GRA)

N82-25787# Duke Univ., Durham, N. C. School of Business Administration.

CONTINGENT DECISION BEHAVIOR: A REVIEW AND DISCUSSION OF ISSUES

John W. Payne Feb. 1982 61 p refs

(Contract N00014-80-C-0114; NR Proj. 197-063)

(AD-A111655; ONR-82-1) Avail: NTIS HC A04/MF A01 CSCL 05/10

A question of great concern in decision research is the extent to which the strategies used by an individual in making a judgment or choice are invariant across task environments. This paper reviews research showing that information processing in decision making, as in other areas of cognition, is highly contingent upon the demands of the task. Theoretical frameworks for handling task and context effect are explored: (1) Cost/benefit principles; (2) Perceptual processes; and (3) Adaptive production systems. Both the cost/benefit and perceptual frameworks are shown to have strong empirical support. Both frameworks, however, also have unresolved conceptual problems that are discussed. The adaptive production system framework has less direct support, but has the desirable property that it contains elements of both of the other frameworks. The question of how the different theoretical frameworks might be integrated is explored.

Author (GRA)

N82-25788# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

RECOGNITION EXPERIMENTS WITH THERMAL IMAGES. PART 2: EFFECT OF RASTER FREQUENCY In DUTCH; ENGLISH summary

A. vanMeeteren and J. M. Schipper 1980 21 p refs

(Contract A76/KL/080)

(IZF-1980-14; TDCK-75109) Avail: NTIS HC A02/MF A01

The effect of raster frequency in recognition experiments with thermal images was investigated. Experiments, determining the recognition chance as a function of scan line density, are described. For raster scanned images, the raster frequency is the dominant image quality factor. The modulation transfer functions of sampling aperture and display spot are of minor significance with regard to recognition of relevant objects in practical situations. The probability of recognition of a set of thermal pictures was measured psychophysically as a function of the raster frequency. When averaged over 6 objects in different orientations and with different degrees of warming up, the critical raster frequency required for 70% correct identification turned out to be 1.7 lines per meter on the target. However, this critical raster frequency differs considerably for different objects as well as for different appearances of the same object. It makes no sense to normalize the critical raster frequency relative to object dimensions. The prediction of the useful range of actual thermal imaging devices is outlined, starting from experimental data. Author (ESA)

N82-25789# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Afd. Visuologie.

RECOGNITION EXPERIMENTS WITH THERMAL IMAGES. PART 3: EFFECT OF CONTRAST RENDITION

W. J. H. Meijer and A. vanMeeteren Apr. 1981 24 p refs In DUTCH; ENGLISH summary

(Contract A76/KL/080)

(IZF-1981-5; TDCK-75519) Avail: NTIS HC A02/MF A01

The adjustment of contrast and luminance of displays for thermal imaging devices is discussed, with reference to adapting the dynamic range of the display to the dynamic range of the signals. Two questions are discussed with regard to this adaptation: the recognizability of thermal images affected if the dynamic range of the display is not fully utilized and advantages in displaying part of the signal range, e.g., colder regions or warmer regions, with enhanced contrast. Experiments demonstrate the best strategy utilizes both the signal and the display dynamics as completely as possible. Author (ESA)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N82-25790# Admiralty Marine Technology Establishment, Teddington (England).

APU MAN-COMPUTER STUDIES GROUP SEMINAR PROCEEDINGS 1

R. Gregory HMSO Jun. 1980 50 p refs Proceedings held at Teddington, England, Feb. - Apr. 1980

(AMTE(E)-TM-80109; BR76709) Avail: NTIS HC A03/MF A01

Seminars held to explore the potential of computers as intelligent assisting devices in training and operational contexts are summarized. A cybernetic framework is proposed for understanding computer assisted instruction. Subject matter representation and knowledge representation schemes are presented. For individual titles, see N82-25791 through N82-25793.

N82-25791# Admiralty Marine Technology Establishment, Teddington (England).

THREE COMPUTER ROLES IN A CYBERNETIC LEARNING SYSTEM

In its APU Man-Computer Studies Group Seminar Proc. 1 Jun. 1980 p 7-17 refs (For primary document see N82-25790 16-54)

Avail: NTIS HC A03/MF A01

The importance of subject matter or knowledge representation in computer assisted instruction CAI is discussed. The components of such a learning system are identified as the learner, subject matter representation, subject matter expert, and the tutor. Within this framework, three roles that a computer can play in a learning system are discussed. The location of the system tutor, the component which mediates the learning process, is shown to be directly related to the sensitivity of the computer to the learner. A pre-CAI system where the computer is used as a simulator, a conventional CAI system, and an intelligent CAI system where the computer contains the tutor are outlined.

Author (ESA)

N82-25792# Admiralty Marine Technology Establishment, Teddington (England).

THE REPRESENTATION OF KNOWLEDGE: GOLDSTEIN'S GENETIC GRAPH

In its APU Man-Computer Studies Group Seminar Proc. 1 Jun. 1980 p 19-31 refs (For primary document see N82-25790 16-54)

Avail: NTIS HC A03/MF A01

The genetic graph is a computer based data structure that holds a knowledge representation, i.e., part of a program combining the technology of artificial intelligence with computer aided instruction (CAI). The structure emphasizes the representation of the evolution of expertise from the perspective of the learner with respect to intelligent CAI. An epistemology is established as the connective structure of the graph. The links between nodes themselves represent learning processes, such as generalization, analogy and refinement. As a result, the genetic graph allows a powerful modelling facility, i.e., the coaching system is more sensitized to development of the learner's expertise, this being achieved by the graph's capacity to yield information about the learner's knowledge state, his learning style and his route through the syllabus. Author (ESA)

N82-25793# Admiralty Marine Technology Establishment, Teddington (England).

THE REPRESENTATION OF KNOWLEDGE: PASK'S L SUB P

In its APU Man-Computer Studies Group Seminar Proc. 1 Jun.

1980 p 33-46 refs (For primary document see N82-25790 16-54)
Avail: NTIS HC A03/MF A01

A general introduction to the proto language L sub p for the representation of conversations between intelligent entities is given. The main concepts and operations that constitute L sub p are explained including derivation, coherency and organizational closure, rule of Genoa and analogy, pruning, saturation, condensation, and analogy and isomorphic inference. The computer implementation of L sub p THOUGHTSTICKER is treated. It is used to represent the knowledge held by one or more persons concerning any conversational domain. Knowledge is represented as topics at nodes of a mesh which may be linked by derivational, analogical, or both types of connectivity. Author (ESA)

N82-25794# Naval Submarine Medical Research Lab., Groton, Conn.

COLD WEATHER GOGGLES. 1: OPTICAL EVALUATION Interim Report

S. M. Luria, David F. Neri, Jo Ann S. Kinney, and Helen M. Paulson 19 Jan. 1982 34 p refs
(M0095PN001)
(AD-A111333; NSMRL-970) Avail: NTIS HC A03/MF A01 CSCL 06/17

To compare the utility of a dozen protective goggles for the cold, their transmittance of harmful radiation, optical quality, resistance to fogging, and comfort were measured. The transmittances were discussed in terms of thresholds for damage to the eye from various bands of light radiation. The optical characteristics were evaluated against military specifications for aviators' visors. All the goggles except one screened out enough UV at sea level, and all but two screened out enough of the visible and infrared radiation. There were wide variations in optical quality, resistance to fogging, and comfort. A set of specifications was drawn up to meet the various requirements, but it was concluded that one set of goggles was unlikely to be satisfactory for the wide range of conditions which would be encountered.
Author (GRA)

N82-25795# Navy Personnel Research and Development Center, San Diego, Calif.

OPERATOR PERFORMANCE ON TWO OFFICE DATA ENTRY SYSTEM TESTBEDS: PRELIMINARY ANALYSES Special Report, 1978 - 1979

Eleanor R. N. Robinson, John S. Malone, and Richard W. Obermayer Feb. 1982 28 p refs
(AD-A111555; NPRDC-SR-82-16) Avail: NTIS HC A03/MF A01 CSCL 05/8

This effort tested the effectiveness of two computerized data entry systems designed to improve operator efficiency and reduce the number of errors in Navy personnel records. Data were collected on operator performance times and the quantities of errors made using (1) a stand-alone system; and (2) a distributed data entry system that used an off-site computer in tandem with an on-site microprocessor. Preliminary analyses of data obtained were conducted to assess user acceptance so that modifications, if needed, could be implemented before the system was installed. Results showed that the distributed office data entry system provided a distinct advantage over the self-contained system in reducing errors in the information system without adding to the office workload. Also, using this distributed system to make changes resulted in a 75 percent time savings over the manual method. The time saved in making changes would be, by itself, a significant factor in evaluating the cost effectiveness of systems employing computer data bases. Author (GRA)

N82-25796# Clarkson Coll. of Technology, Potsdam, N.Y.

ANALYSIS OF THE POLARIZATION DEPENDENCE OF THE INTERACTION BETWEEN HUMAN FRAME TARGETS AND RADIO FREQUENCY SENSOR FIELDS Final Report, 8 May 1979 - 16 Apr. 1981

Harold R. Raemer Griffiss AFB, N.Y. RADC Nov. 1981 293 p refs
(Contract F30602-78-C-0102; AF Proj. DNAR)
(AD-A111590; RADC-TR-81-244) Avail: NTIS HC A13/MF A01 CSCL 17/9

An analytical model of a class of RF intrusion sensor systems was constructed. The constituents of the model are: a slotted coaxial cable laid circularly on the ground, an electromagnetic scatterer intended to simulate a human frame target in the vicinity of the cable and an antenna near the center of the circular configuration. Using the concept of a general electromagnetic field as a superposition of plane-wave fields ('plane-wave spectral representation of fields'), calculations were made of: (a) the fields from the cable slots as if the cable were in free space; (b) the effect of ground reflections on the fields were from the slots; (c) the fields of the waves scattered from the human frame target directly toward the antenna in response to the incident wave fields (a) plus (b); and (d) the effect of ground reflections on the scattered wave fields. These calculations were programmed for the VAX computer and some numerical results are presented for various orientations and positions of the human frame target. Author (GRA)

N82-25797# Army Research Inst. of Environmental Medicine, Natick, Mass.

AUXILIARY COOLING: COMPARISON OF AIR-COOLED VERSUS WATER COOLED VESTS IN HOT-DRY AND HOT-WET ENVIRONMENTS

Yair Shapiro, Kent B. Pandolf, Michael N. Sawka, Michael M. Toner, Fred R. Winsmann, and Ralph F. Goldman 27 Oct. 1981 21 p refs
(DA Proj. 3E1-62777-A-878)
(AD-A110554; USARIEM-M-4/82) Avail: NTIS HC A02/MF A01 CSCL 06/17

Water-cooled, air-cooled and ambient air ventilated auxiliary cooling vests were evaluated in a hot-wet climate (HW) (35 C, 75% rh) and a hot-dry environment (HD) with additional infrared radiation (T sub a = 49 C, 20% rh, 68 C black globe temperature). Twelve subjects dressed in full chemical warfare combat uniforms underwent 120 min of heat exposure in each combination of climate and cooling vest except for the hot-dry environment and ambient-air vest. During each exposure, total exercise time was 20 min and rest time 100 min. This resulted in a mean time weighted metabolic rate of 180 W. No significant differences were found between the air or the water-cooled vests in either the HD or HW climates. It was concluded that an air-cooled vest can be used with the same efficiency as a water-cooled vest. In contrast, the ambient-air vest was shown to have a low effectiveness in HW and to be dangerous in a HD climate.
GRA

N82-25798# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Afd. Technische Menskunde.

VISUAL ERGONOMICS IN CARTOGRAPHIC AND LITHOGRAPHIC WORK AT THE TOPOGRAPHIC SERVICE. PART 2: REQUIREMENTS AND RECOMMENDATION FOR WORK STATIONS

E. Ellens and H. J. Leebeek Jul. 1981 29 p In DUTCH; ENGLISH summary
(Contract A76/KL/001)
(IZF-1981-14-Pt-2; TDCK-75527-Pt-2) Avail: NTIS HC A03/MF A01

Advice about the ergonomics of map engravers work is given. As the different aspects of the advice are very much interwoven, a complete review concerning all the different ergonomic issues is given. The most important aspects are the worktable, sitting, the engraving task itself, working attitudes and general and local lighting. The requirements of each of these points are quite exacting because of the high performance demands of the task. Much attention was paid to the development of a new worktable, specially designed for this type of work. Author (ESA)

N82-25799# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Afd. Visuologie.

INQUIRY OF FIELD EXPERIENCE WITH CAPS FOR THE ROYAL DUTCH ARMY

W. A. Lotens Oct. 1981 12 p ref In DUTCH; ENGLISH summary
(Contract A79/KL/111)
(IZF-1981-21; TDCK-75532) Avail: NTIS HC 02/MF A01

During a field trial, an emergency gas mask was worn by military personnel of eight different armed units and services, developed for the Royal Dutch Army. The average total wearing time was 19.3 hr and the average longest uninterrupted period

was 2.4 hr. complaints, due to breathing impairment and design of the cap were reported. In comparison with the gas mask, however, the cap causes considerably less strain. The cap can be usable in its present shape, however improvements are recommended for breathing impairment compatibility with eyeglasses and optical instruments, leakage at the skin, and the stain of charcoal dust. Author (ESA)

N82-25756# Joint Publications Research Service, Arlington, Va.
DIET OF CREW IN SALYUT-6 ORBITAL STATION
V. P. Bychkov, A. S. Ushakov, S. Kalandarov, M. V. Markaryan, Ye. A. Sedova, A. K. Kivuk, and O. S. Khokhlova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 11-15 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 10-13 (For primary document see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

N82-25759# Joint Publications Research Service, Arlington, Va.
BIOLOGICAL VALUE AND SHELF LIFE OF CULTURED DAIRY PRODUCTS IN THE DIET OF COSMONAUTS
I. A. Radayeva, G. A. Rossikhina, V. A. Usacheva, G. S. Poyarkova, and S. P. Shulkina *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 2, Mar.-Apr. 1982 p 29-33 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmicheskaya Med. (Moscow), v. 16, no. 2, Mar.-Apr. 1982 p 23-26 (For primary document see N82-25754 16-51)
Avail: NTIS HC A08/MF A01

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering*.

N82-25800# Council for Scientific and Industrial Research, Pretoria (South Africa).
COMPUTER-AIDED PRODUCTION
G. Doumeingts 1981 60 p Transl. into ENGLISH from Bull. de Liaison de la Rech. en Informatique et Autom. (South Africa), no. 64, Oct. 1980
(CSIR-Trans-1611) Avail: NTIS HC A04/MF A01

Computer-aided production is defined and the importance of using data processing is discussed in relation to actual production processes. After describing the different stages of the process of attainment of an objective and showing how data processing can be used, the main factors explaining the present interest in this area are presented. S.L.

N82-25801*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ARCHITECTURE FOR VLSI DESIGN OF REED-SOLOMON ENCODERS
K. Y. Liu 8 Jun. 1981 51 p refs
(Contract NAS7-100)
(NASA-CR-168992; JPL-PUB-81-87; NAS 1.26:168992) Avail: NTIS HC A04/MF A01 CSCL 09B

The logic structure of a universal VLSI chip called the symbol-slice Reed-Solomon (RS) encoder chip is discussed. An RS encoder can be constructed by cascading and properly interconnecting a group of such VLSI chips. As a design example, it is shown that a (255,223) RD encoder requiring around 40 discrete CMOS ICs may be replaced by an RS encoder consisting of four identical interconnected VLSI RS encoder chips. Besides the size advantage, the VLSI RS encoder also has the potential advantages of requiring less power and having a higher reliability. B.W.

N82-25802# University of Southern California, Marina del Rey. Information Sciences Inst.
DARPA INTERNET PROGRAM. INTERNET AND TRANSMISSION CONTROL SPECIFICATIONS
Jonathan B. Postel Sep. 1981 183 p
(Contract MDA903-81-C-0335)
(AD-A111091; ISI-RFC790-796) Avail: NTIS HC A09/MF A01 CSCL 17/2

These protocols are designed for use in an interconnected system of packet switched networks. The Internet Protocol is a basic universal protocol, and provides a uniform address space, as well as the mechanism for routing datagrams through the connected set of networks and for the fragmentation and reassembly of long datagrams if necessary for transmission through small packet networks. The Transmission Control Protocol is designed to be a highly reliable end-to-end data stream connection protocol between hosts, using mechanisms such as checksums, positive acknowledgements and timeouts with retransmission, and flow control. Author (GRA)

N82-25803# California Inst. of Tech., Pasadena.
SUBMICRON SYSTEMS ARCHITECTURE PROJECT Status Report, 30 Jun. - 30 Sep. 1981
Charles L. Seitz, Carver Mead, and Lennart Johnsson Nov. 1981 13 p refs
(Contract N00014-79-C-0597; ARPA Order 3771)
(AD-A110605) Avail: NTIS HC A02/MF A01 CSCL 09/2

This project is concerned with the architecture, design, and testing of VLSI Systems. The principal activities in this report period include: The Tree Machine; COPE, The Homogeneous Machine; Computational Arrays; Switch-Level Model for MOS Logic Design; Testing; Local Network and Designer Workstations; Self-timed Systems; Characterization of Deadlock Free Resource Contention; Concurrency Algebra; Language Design and Logic for Program Verification. GRA

N82-25804# Manlabs, Inc., Cambridge, Mass.
COMPUTER BASED METHODS FOR THERMODYNAMIC ANALYSIS OF MATERIALS PROCESSING Annual Report, 1 Oct. 1980 - 30 Sep. 1981
Larry Kaufman 2 Nov. 1981 89 p refs
(Contract F49620-80-C-0020; AF Proj. 2306)
(AD-A111227; AFOSR-81-0876TR) Avail: NTIS HC A05/MF A01 CSCL 09/2

The data base previously developed for multicomponent SIALON Ceramic phase diagrams has been expanded to cover Ce2O3 additions. The Ce2O3-SiO2 and Ce2O3-Si3N4 systems have been computed. Isothermal sections in the MgO-Si3N4-SiO2, Y2O3-SiO2-Si3N4 and Ce2O3-SiO2-Si3N4 systems near 2000 K have been computed and compared with limited experimental data. A data base has also been developed for calculating binary, ternary and multi-component phases diagrams for III-V and II-VI compound systems. The trajectory of ordering temperatures for A2/B2 and B2/DO3 reactions has been computed along the Fe3Si-Fe3Al composition path in the BCC of the Fe-Al-Si system and compared with experiment. The two phase (fcc + bcc) fields for disordered phases in the iron-aluminum-nickel, iron-aluminum-manganese, and the iron-nickel-manganese system between 900 and 1200 C. Construction of

a data base covering fluoride systems consisting of systems containing ZrF4 which are employed to synthesize fluoride glasses has been initiated. Author (GRA)

N82-25805# Los Alamos Scientific Lab., N. Mex.
LSI-11/MOTOROLA MICROCOMPUTER DEVELOPMENT SYSTEM
Steven C. Bourret Oct. 1981 9 p
(Contract W-7405-eng-36)
(DE82-004189; LA-9059-MS) Avail: NTIS HC A02/MF A01

A microcomputer development system was built using an RT-11 operating system and a cross assembler to develop microcomputer based stepping motor controller to work with an LSI-11 host computer. The advantage of this technique is that we can use the familiar LSI-11 hardware and the powerful RT-11 operating system software for other microcomputer development. The technique and its use in developing the stepping motor controller are described. DOE

N82-25806# Istituto di Ricerca e Tecnologia per lo Studio del Plasma Nello Spazio, Frascati (Italy).
TEXT EDITOR BY THE HP-1000 SYSTEM [TEXT EDITOR PER IL SISTEMA HP-1000]
P. Cerulli-Irelli 5 Jun. 1981 18 p In ITALIAN
(IPS-81-10) Avail: NTIS HC A02/MF A01

A computer program prepared to facilitate type writing, using the HP-1000 computer is described. The whole of the text may be memorized and the corrections on memorized texts are easy to make. The program is written in FORTRAN and uses the compiler FORTRAN 4X with the operating system RTE4-B. Examples, using memorized addresses and standard phrases, are included. Author (ESA)

N82-25807# Little (Arthur D.), Inc., Cambridge, Mass.
THE EFFECTS OF FUTURE INFORMATION PROCESSING TECHNOLOGY ON THE FEDERAL GOVERNMENT ADP SITUATION
Sep. 1981 106 p refs Prepared in cooperation with General Systems Group, Inc.
(PB82-138181; NBS-GCR-81-342) Avail: NTIS HC A06/MF A01 CSCL 09B

The effects on the Federal ADP inventory of new and expected automated data processing technology, shifts in industry structure, and proposed changes in Federal ADP regulations are qualitatively forecasted. Underlying technologies, changes in the information industry and market, future products and systems, the present Federal ADP situation, and proposed policy changes are discussed. GRA

N82-25808# SoHaR, Inc., Los Angeles, Calif.
COMPUTER SCIENCE AND TECHNOLOGY: A SURVEY OF SOFTWARE TOOLS USAGE Final Report
Herbert Hecht Nov. 1981 61 p refs
(PB82-134743; NBS-SP-500-82; LC-81-600112) Avail: NTIS HC A04/MF A01 CSCL 09B

The state of the art regarding the development and use of software tools is presented. The information was gathered from an in-depth survey of 23 sites with Government and industry. A comparison is made among the levels of tool usage based on the size and type of programming group. The survey examines aspects that both promote or inhibit tool usage and provide requirements for the future. GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N82-25809*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
COMPUTERIZED DATA COLLECTION AND REDUCTION FROM AN X-RAY DIFFRACTOMETER
John C. McClure May 1982 19 p refs
(NASA-TM-82479; NAS 1.15:82479) Avail: NTIS HC A02/MF A01 CSCL 09B

A series of computer programs written for use with a Philips X-ray diffractometer and a Hewlett Packard 9825A desk top computer is described. These programs permit the collection and storage on disk of the number of X-ray counts and the associated 2-thera angles across line profiles. Automatic background subtraction, integrated intensity, correction for the angular dependance of the Lorentz, polarization, and atomic scattering factors, peak location, K-alpha 2 removal, and calculation of Fourier coefficients are performed. The programs are written for a computer configured with a disk drive, but they can be easily modified to run from the cassette tape drive that is integral to the 9825A computer. M.G.

N82-25810*# Systems Science and Software, San Diego, Calif.
ADDITIONAL EXTENSIONS TO THE NASCAP COMPUTER CODE, VOLUME 1 Contractor Report, 9 Sep. 1980 - 22 Dec. 1981
M. J. Mandell, I. Katz, and P. R. Stannard Oct. 1981 246 p refs Revised
(Contract NAS3-22536)
(NASA-CR-167855; NAS 1.26:167855; SSS-R-82-5249-Rev) Avail: NTIS HC A11/MF A01 CSCL 09B

Extensions and revisions to a computer code that comprehensively analyzes problems of spacecraft charging (NASCAP) are documented. Using a fully three dimensional approach, it can accurately predict spacecraft potentials under a variety of conditions. Among the extensions are a multiple electron/ion gun test tank capability, and the ability to model anisotropic and time dependent space environments. Also documented are a greatly extended MATCHG program and the preliminary version of NASCAP/LEO. The interactive MATCHG code was developed into an extremely powerful tool for the study of material-environment interactions. The NASCAP/LEO, a three dimensional code to study current collection under conditions of high voltages and short Debye lengths, was distributed for preliminary testing. M.G.

N82-25811*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN ASSESSMENT OF THE REAL-TIME APPLICATION CAPABILITIES OF THE SIFT COMPUTER SYSTEM
Ricky W. Butler Apr. 1982 17 p refs
(NASA-TM-84482; NAS 1.15:84482) Avail: NTIS HC A02/MF A01 CSCL 09B

The real-time capabilities of the SIFT computer system, a highly reliable multicomputer architecture developed to support the flight controls of a relaxed static stability aircraft, are discussed. The SIFT computer system was designed to meet extremely high reliability requirements and to facilitate a formal proof of its correctness. Although SIFT represents a significant achievement in fault-tolerant system research it presents an unusual and restrictive interface to its users. The characteristics of the user interface and its impact on application system design are assessed. Author

N82-25812# Stanford Univ., Calif. Dept. of Computer Science.
VERIFICATION OF SEQUENTIAL PROGRAMS: TEMPORAL AXIOMATIZATION
Zohar Manna Sep. 1981 46 p refs Prepared in cooperation with Weizmann Inst. of Science, Rehovott, Israel
(Contract N00014-76-C-0687; Grants AF-AFOSR-0014-81; NSF MCS-80-06930)
(AD-A111804; SU-STAN-CS-81-877) Avail: NTIS HC A03/MF A01 CSCL 09/2

This is one in a series of reports describing the application of temporal logic to the specification and verification of computer programs. Earlier reports introduced temporal logic as a tool for reasoning about concurrent computer programs and specifying their properties (MP1) and presented proof principles for establishing these properties (MP2). This report focuses on deterministic, sequential programs. Presented is a proof system in which properties of such programs, expressed as temporal formulas, can be proved formally. This proof system consists of three parts: a general part elaborating the properties of temporal logic, a domain part giving an axiomatic description of the data domain, and a program part giving an axiomatic description of the program under consideration. The use of the

proof system is illustrated through the presentation of two alternative formal proofs of the total correctness of a simple program. GRA

N82-25813# Massachusetts Univ., Amherst. Dept. of Computer and Information Science.
PROCESSING CONES: A COMPUTATIONAL STRUCTURE FOR IMAGE ANALYSIS Interim Report
Allen R. Hanson and Edward M. Riseman Dec. 1981 47 p refs
(Contract N00014-75-C-0459; Grant NSF MCS-79-18209)
(AD-A111761; COINS-TR-81-38) Avail: NTIS HC A03/MF A01 CSCL 09/2

A layered hierarchical parallel array architecture for image analysis applications, referred to as a processing cone, is described and sample algorithms are presented. A fundamental characteristic of the structure is its hierarchical organization into two-dimensional arrays of decreasing resolution. In this architecture, a protypical function is defined on a local window of data and applied uniformly to all windows in a parallel manner. Three basic modes of processing are supported in the cone: reduction operations (upward processing), horizontal operations (processing at a single level) and projection operations (downward processing). Complex image analysis algorithms are specified as temporal sequences of function applications. The cone structure forms the basis of a sophisticated operating system for an image analysis environment. Author (GRA)

N82-25814# Mississippi State Univ., Mississippi State. Dept. of Electrical Engineering.
THE APPLICATION OF SPECIAL COMPUTING TECHNIQUES TO SPEED-UP IMAGE FEATURE EXTRACTION AND PROCESSING TECHNIQUES Final Technical Report, 9 Jan. 1980 - 1 Jun. 1981
Robert W. McLaren and William D. McFarland Griffiss AFB, N.Y. RADC Dec. 1981 200 p refs
(Contract F30602-80-C-0032; AF Proj. 4594)
(AD-A111882; RADC-TR-81-230) Avail: NTIS HC A09/MF A01 CSCL 05/8

Advances in solid state technology have created vast amounts of digital information for image processing. It has become evident that conventional serial type processors are no longer sufficient to handle and manipulate these vast amounts of data for feature extraction and other image processing routines in general. The results of this report indicate that reductions in processing times of one to two orders of magnitude can be obtained for certain algorithms when implemented on special machine architectures. Author (GRA)

N82-25815# Naval Research Lab., Washington, D. C.
THE DESIGN OF A REAL-TIME SIGNAL SORTER Final Report
Timothy R. Husson and Robert H. Evans 1 Feb. 1982 34 p refs
(WF34372091)
(AD-A110914; NRL-8558) Avail: NTIS HC A03/MF A01 CSCL 09/2

This is a final report on a project to design, build, and test a model of high-speed signal sorting system. The digital inputs to this system would be radar receiver data at rates up to one million input pulses per second. The signal sorter must identify and sort the different signals in the data system. This report describes the software simulation which was created and used to design the signal-sorter architecture and algorithms. Also described is the hardware prototype model which was built and successfully tested. Author (GRA)

N82-25816# Stanford Univ., Calif. Dept. of Computer Sciences.
ADAM: AN ADA BASED LANGUAGE FOR MULTIPROCESSING
D. C. Luckham, H. J. Larsen, D. R. Stevenson, and F. W. vonHenke Jul. 1981 72 p refs
(Contract MDA903-80-C-0159)
(AD-A110920; SU-STAN-CS-81-867) Avail: NTIS HC A04/MF A01 CSCL 09/2

Adam is an experimental language derived from ADA. It was developed to facilitate study of issues in ADA implementation. The two primary objectives which motivated the development of Adam were: to program supervisory packages for multitask scheduling, and to formulate algorithms for compilation of ADA tasking. Adam is a subset of the sequential program constructs of ADA combined with a set of parallel processing constructs which are lower level that ADA tasking. In addition, Adam places strong restrictions on sharing of global objects between processes. Import declarations and propagate declarations are included. A compiler has been implemented in Maclisp on a DEC PDP-10. It produces assembly code for PDP-10. It supports separate compilation, generics, exceptions and parallel processes. Algorithms translating ADA tasking into Adam parallel processing have been developed and implemented. An experimental compiler for most of the final ADA language design, including task types rendezvous constructs, based on the Adam compiler, is presently available on PDP-10's. This compiler uses a procedure call implementation of task rendezvous, but will be used to develop and study alternate implementations. Author (GRA)

N82-25817# Syracuse Univ., N. Y. School of Computer and Information Science.
INTEGRATED PARALLEL PROCESSES: THE ELEMENTS OF MEANING IN LANGUAGE, VOLUME 4 Final Technical Report, 1 Oct. 1977 - 30 Sep. 1980
Edward F. Storm Griffiss AFB, N.Y. RADC Nov. 1981 139 p refs 5 Vol.
(Contract F30602-77-C-0235; AF Proj. 5581)
(AD-A110809; RADC-TR-80-379-Vol-4) Avail: NTIS HC A07/MF A01 CSCL 09/2

This document reports in summary form some investigations into the notion of meaning underlying language, thought and behavior in humans. The general conclusion is that a rigorous specification of cyclic or recurring processes, and the hypothesis that these processes are the realities that underly language, thought and behavior will significantly expand our understanding of these issues, and will enhance our capacity to develop disciplined and responsible technology to improve human communication. In particular, we may look forward to more fully adequate and more sensitive systems for communication between the human and the computer. This report presents its material in a preliminary way and discusses in outline form some ideas current in the relevant literature that led to that material. Precise formulations are not included, nor are there adequate examples to justify the material. Careful and thorough formulation, adequate implementation, and substantive applications constitute the next phases of this project. GRA

N82-25818# Syracuse Univ., N. Y. School of Computer and Information Science.
PROVING PROGRAM CORRECTNESS, VOLUME 5 Final Technical Report, 1 Oct. 1977 - 30 Sep. 1980
John C. Reynolds Griffiss AFB, N.Y. RADC Nov. 1981 95 p refs
(Contract F30602-77-C-0235; AF Proj. 5581)
(AD-A110810; RADC-TR-80-379-Vol-5) Avail: NTIS HC A05/MF A01 CSCL 09/2

The 'Language Studies' contract is divided into four project areas, all of which are directed to the problems of effectively, reliably and efficiently using modern computers in a wide range of applications. Three of the projects deal with methods of communicating with computers. Proving Program Correctness (P.O.: J.C. Reynolds). This group is working towards programming language designs which increase the probability that specification errors will be detected by the compiler or interpreter and to provide the language facilities so that users will more nearly be able to prove that programs perform as they are specified than is currently possible. GRA

N82-25819# University of Southeastern Massachusetts, North Dartmouth. Dept. of Electrical Engineering.
A FURTHER STUDY OF THE MULTICHANNEL MAXIMUM ENTROPY SPECTRAL ANALYSIS
C. H. Chen and Gia-Kinh Young 19 Feb. 1982 41 p refs
(Contract N00014-79-C-0494)
(AD-A111435; SMU-EE-TR-82-03) Avail: NTIS HC A03/MF A01 CSCL 09/2

Based on the multichannel generalization of the Burg's maximum entropy spectral analysis, the report reviews the

computing procedures and closely examines the software realization problem by using sinusoids as examples. The high-resolution auto- and cross spectra available are practically significant. For example, the phase difference estimate is useful for time delay estimation. The line-splitting and frequency shifting phenomena are more evident in real signals than in multichannel complex signals. Detailed computer program listing is provided. Author (GRA)

N82-25820# Naval Postgraduate School, Monterey, Calif.
THE STRUCTURAL ANALYSIS OF PROGRAMMING LANGUAGES
Bruce J. MacLennan Sep. 1981 30 p refs
(RR0000110)
(AD-A111688; NPS52-81-009) Avail: NTIS HC A03/MF A01 CSCL 09/2

A language's structures are some of its most important characteristics. These include the data structures -- those mechanisms that the language provides for organizing elementary data values. They also include the control structures, which organize the control flow. Less obviously, they include the same structures, which partition and organize the name space. Languages can be compared relative to their structures in the data, control, and name domains. This report describes a syntax-independent method of representing the structures of a language which facilitates visual complexity comparisons and is amenable to measurement. The data, control, and name structures of a number of languages are analyzed, including Pascal, LISP, Algol-60, Algol-68, the lambda calculus, FORTRAN, and Basic. Author (GRA)

N82-25821# SRI International Corp., Menlo Park, Calif.
AUTOMATIC HANDWRITING VERIFICATION (AHV) Final Technical Report, Oct. 1979 - Mar. 1981
John S. Ostrem and Hewitt D. Crane Griffiss AFB, N.Y. RADC Nov. 1981 81 p refs Sponsored in part by Defense Nuclear Agency
(Contract F30602-79-C-0255; AF Proj. 6271; SRI Proj. 8895)
(AD-A111329; RADC-TR-81-328) Avail: NTIS HC A05/MF A01 CSCL 09/2

Over a four-month period, 5,220 signatures and 1,740 numeric 'Signatures' were collected from 59 subjects writing with the SRI pen. Twelve trained 'forgers' attempted 648 forgeries; they were given copies of the true signer signatures as well as information about how the SRI system works and what measures would be used to perform the signature verification. The forgers were also allowed to practice their forgeries and to view video tapes of the true signers writing their signatures. Data were analyzed to determine Type I/Type II error curves and average access time. For typical conditions, the True vs. Forgeries Type I/Type II equal-error rate was on the order of one percent, and the average access time, including the time to write the signature, was 8.5 seconds. These results are based on a features algorithm for signature verification using the same set of features for all subjects. It is shown that significant improvement may be achieved with the features technique if the feature sets are individualized for each user. Even greater improvement can be achieved with a correlation method of analysis, although this requires an increase in memory storage costs and computer processing time. Author (GRA)

N82-25822# Digital Decision Systems, Inc., Knoxville, Tenn.
MULTI-SENSOR SCENE AND ANALYSIS Final Technical Report, 1 Feb. 1980 - 30 Apr. 1981
Ernest L. Hall and Rafael C. Gonzales Griffiss AFB, N.Y. RADC Sep. 1981 321 p refs
(Contract F30602-80-C-0084; AF Proj. 4594)
(AD-A110812; RADC-TR-81-255) Avail: NTIS HC A14/MF A01 CSCL 05/8

This technical report contains a detailed analysis of digital computer image analysis and scene synthesis algorithms and techniques in order to provide the basis for the design of an Image Assembly System capable of functioning as a flexible research aid for both areas. A survey of common image and scene analysis algorithms is presented which includes image enhancement techniques as well as modern scene segmentation and object location techniques. Special emphasis is given to image representation models using relational tables and data structures for image analysis. A survey of important scene synthesis algorithms is given which includes three dimensional scene representation, hidden surface elimination, and surface shading techniques. The requirements in terms of hardware and software for separate analysis and synthesis systems are presented. Using the previous survey of algorithms and system requirements as a basis, a performance specification for the Image Assembly is defined. An example system consisting of available hardware elements is presented to demonstrate the practicality of the performance specification. GRA

N82-25823# Arizona Univ., Tucson. Digital Image Analysis Lab.
AUTOMATION OF IMAGE PROCESSING Final Report
B. R. Hunt 15 May 1981 44 p
(Contract N00014-80-C-0344)
(AD-A111029; SIE/DIAL-81/007) Avail: NTIS HC A03/MF A01 CSCL 05/8

This is the summary report of a study group in the Automation of Image Processing active during 1980, jointly funded by NSF and ONR. Author (GRA)

N82-25824# Carnegie Inst. of Tech., Pittsburgh, Pa. Management Sciences Research Group.
INTEGER PROGRAMMING
Egon Balas Nov. 1981 32 p refs
(Contract N00014-75-C-0621; Grant NSF ECS-79-0250; NR Proj. 047-408)
(AD-A110913) Avail: NTIS HC A03/MF A01 CSCL 12/1

This is an introductory survey of integer programming, its theory, methodology and applications, for the Encyclopedia of Statistical Sciences. Author (GRA)

N82-25825# Measurement Concept Corp., Rome, N. Y.
RASTER SCANNED CHARACTER RECOGNITION (RSCR) Final Technical Report, Oct. 1978 - Mar. 1981
David W. Clark and Kathryn Sands Przewiocki Griffiss AFB, N.Y. RADC Nov. 1981 90 p refs
(Contract F30602-78-C-0348; AF Proj. 3203)
(AD-A111331; RADC-TR-81-323) Avail: NTIS HC A05/MF A01 CSCL 09/2

The objective of the RSCR was to design and implement a software system which produces bathymetric depth sounding information for input to a digital data base. Input to the RSCR is raster scanned smooth sheets which consist of handwritten depth soundings. The RSCR system includes software to: (1) isolate smooth sheet hand drafted numeric depth soundings from raster scanned input, (2) provide isolated characters to a character recognition routine, and (3) construct and locate output depth soundings in digital format for subsequent use by the Defense Mapping Agency Hydrographic/Topographic Center (DMAHTC). The Hand-printed Symbol Recognition (HSR) software developed by computer Sciences Corp and the Naval Ocean Research and Development Activity (NORDA) is the character recognition routine used. This report documents all of the above mentioned capabilities except the HSR software itself which has been documented separately by CSC and NORDA. GRA

N82-25826# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
SYSTEM RELIABILITY: A MICROCOMPUTER SOLUTION TECHNIQUE M.S. Thesis
Donald R. Turos, Jr. Dec. 1981 144 p refs
(AD-A111429; AFIT/GOR/OS/81D-9) Avail: NTIS HC A07/MF A01 CSCL 09/2

This study investigates the feasibility of using a microcomputer to calculate system reliabilities. The computer program, written in Pascal on an Apple II computer, uses interactive graphics to allow a user to manipulate a system of components. The components are limited to a constant reliability in parallel and series structures. Once a calculation has been made, the user can then reconfigure the system and recalculate the reliability. This technique may provide insights to how the system reliability changes as components are changed. The appendices include the system configuration, User's Guide, Progammer's Guide, and program listing. Author (GRA)

N82-25827# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Structures Test Branch.
STRUCTURES TESTING ANALYSIS REAL-TIME NETWORK (STARNET) Final Technical Report, Feb. 1976 - Feb. 1981
Robert L. Denison Oct. 1981 93 p
(AF Proj. 1347; AF Proj. 2401)
(AD-A111636; AFWAL-TR-81-3112) Avail: NTIS HC A05/MF A01 CSCL 14/2

The computer network employed for data acquisition and processing in the Structures Test Facility of the Air Force Wright Aeronautical Laboratories, Building 65, Area B, Wright-Patterson AFB, is extensively described. The report includes a system overview and discussions of subsystem characteristics and interconnections, system software, applications software, system operation, and a review of a large-scale network mode application. This computer network, called STARNET, is an on-line, real-time system. Author (GRA)

N82-25828# Intermetrics, Inc., Cambridge, Mass.
ADA INTEGRATED ENVIRONMENT I COMPUTER PROGRAM DEVELOPMENT SPECIFICATION, VOLUME 2 Interim Report, 15 Sep. 1980 - 15 Mar. 1981
Griffiss AFB, N.Y. RADC Dec. 1981 94 p
(Contract F30602-80-C-0291; AF Proj. 5581)
(AD-A110573; RADC-TR-81-358-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 09/2

The ADA Integrated Environment (AIE) consists of a set of software tools intended to support design, development and maintenance of embedded computer software. A significant portion of an AIE includes software systems and tools residing and executing on a host computer (or set of computers). This set is known as an ADA Programming Support Environment (APSE). This B-5 Specification describes, in detail, the design for a minimal APSE, called a MAPSE. The MAPSE is the foundation upon which an APSE is built and will provide comprehensive support throughout the design, development and maintenance of ADA software. The MAPSE tools described in this specification include an ADA compiler, linker/loader, debugger, editor, and configuration management tools. The kernel (KAPSE) will provide the interfaces (user, host, tool), database support, and facilities for executing ADA programs (runtime support system). Author (GRA)

N82-25829# Defense Mapping Agency, Washington, D.C.
LESSONS LEARNED ON THE ROAD TO A MODERN PROGRAMMING ENVIRONMENT Final Report
Annette J. Krygiel 6 Jan. 1982 18 p refs
(AD-A111102) Avail: NTIS HC A02/MF A01 CSCL 09/2

The problems of coping with increasing levels of automation in a large organization are formidable ones. Not the least of these is the organization's investment in the computer software needed to deliver its products. The environment in which the software is developed must be supportive, allowing rapid generation of error-free and maintainable computer code which meets user requirements. Defining the components which constitute this environment -- called a Modern Programming Environment (MPE) -- is merely a first step. Constructing the environment and then ensuring the proper interaction of personnel with it must also be accomplished. This paper discusses some of the steps that have already been taken by the Defense Mapping Agency to proceed to an MPE and the lessons learned along the way. Author (GRA)

N82-25830# General Atomic Co., San Diego, Calif.
ARRAY-PROCESSOR TIME-SHARING SYSTEM
T. S. Wang Oct. 1981 17 p refs
(Contract DE-AT03-76ET-51011)
(DE82-004041; GA-A-16399) Avail: NTIS HC A02/MF A01

A simple time-sharing system that allows queued access to an array processor is described. The system was implemented at General Atomic on a DEC system-10 computer to control a Floating Point Systems AP190L array processor. For several users simultaneously running an MHD equilibrium code, the throughput rate is increased at least by a factor of two to three. Author

N82-25831# Los Alamos Scientific Lab., N. Mex.
THE 2DL: A LAGRANGIAN TWO-DIMENSIONAL FINITE-DIFFERENCE CODE FOR REACTIVE MEDIA
J. N. Johnson, C. L. Mader, and M. S. Shaw Aug. 1981 145 p refs
(Contract W-7405-eng-36)
(DE82-002597; LA-8922-M) Avail: NTIS HC A07/MF A01

A CDC 7600 FORTRAN code for computing two dimensional shock wave problems in planar and cylindrical geometry is described. Reactive and nonreactive condensed and gaseous components are included. Chemical reactions are treated by an Arrhenius rate law, C-J volume burn, sharp shock burn, and the forest fire burn model. Elastic/plastic flow and spallation are included for treatment of solid materials. The HOM equation of state describes thermodynamic properties of detonation products, undecomposed explosives, mixtures of the two, and nonreactive condensed components with an instantaneous phase change. DOE

N82-25832# Research Inst. of National Defence, Stockholm (Sweden).
REAL-TIME SIMULATION IN A TERRAIN MODEL. A GENERAL DESCRIPTION
Keneth Carlsson Jan. 1982 15 p
(FOA-C-56028-H2) Avail: NTIS HC A02/MF A01

A 3x5 m 1:100 terrain model used in behavioral research on perception and cognition related to weapon systems is described. A turntable serves as a platform for sights, visual devices and weapons. For pointing at the surface of the model, i.e., as feedback to a gunner, a laser pointer is used. A mobile target can be moved on the terrain surface in any direction. A digital computer controls the simulator and carries out the calculations during simulation. Author (ESA)

N82-25833# SEMA (Metra International), Paris (France).
IOHARP PACKAGE: VERSION 3.0
J. J. Guezennec and J. M. Leglas Paris ESA Feb. 1981 49 p refs
(Contract ESTEC-4397/80/NL-AK)
(JMLG/LL-677; ESA-CR(P)-1526) Avail: NTIS HC A03/MF A01

The Lockheed orbital heat rate package was modified. The IOHARP package consists of: three versions of VUFACT, for 70, 125, or 250 nodes, divided into 5 subroutines composed of < 400 cards each; 70, 125 and 250 node versions of RADCON, incorporating a sparse matrix technique; 70, 125 and 250 node versions of ROHEAT, incorporating an element change option suppressed in VUFACT; and PRTPCH, which transforms VUFACT, RADCON and ROHEAT output files into a SINDA input file. Author (ESA)

N82-25834# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
KALMAN ANALYZER FOR TEST SHORTENING VIA EXTRAPOLATION OF TEMPERATURES (KANTES) Final Report
Martin Sander Paris ESA 29 Oct. 1981 22 p
(Contract ESTEC-4410/80/NL-PP)
(ESA-CR(P)-1528) Avail: NTIS HC A02/MF A01

An on-line program which reduces thermal balance test duration was developed and tested. Kalman filtering is used along with a sieve which eliminates anomalous state vector inputs. A nonlinear regression lead in technique conditions the Kalman parameters. The program consists of 15 modules, each containing up to 100 executable FORTRAN statements, contained within 2145 cards. The program was tested, using Meteosat P2 test data. Equilibrium test phases, corresponding to solar angles of -25, +25 and OC, were used. Time savings of up to 43% are achieved. Author (ESA)

N82-25835# Research Inst. of National Defence, Linkoeping (Sweden).
[ACTIVITIES REPORT OF THE LABORATORY FOR COMPUTER SCIENCE FOA 32, AND ENGINEERING PSYCHOLOGY AND INFORMATION SYSTEMS FOA 53] Annual Report, 1981
Feb. 1982 34 p refs
(FOA-C-30260-E1) Avail: NTIS HC A03/MF A01

Research into computerized image processing, man computer interaction, and applications programming is summarized. Stochastic labeling techniques, aerial photograph segmentation, and map data-picture integration were studied. Image quality,

enhancement, and restoration were investigated. Decision making, man-computer dialogues, computer aided display systems for surveillance, and electronic display of flight information were researched. Author (ESA)

N82-25836# SoHaR, Inc., Los Angeles, Calif.
SYNOPSIS OF INTERVIEWS FROM A SURVEY OF SOFTWARE TOOL USAGE
Herbert Hecht Nov. 1981 81 p refs
(Contract NB79-SBCA-0273)
(PB82-133521; NBSIR-81-2388) Avail: NTIS HC A05/MF A01 CSCL 09B

Interviews conducted as part of a survey of the development and use of software tools in industry and government are summarized. The tools encountered are classified. GRA

62 COMPUTER SYSTEMS

Includes computer networks.

N82-25837# Los Alamos Scientific Lab., N. Mex.
EXPERIENCE WITH FILE MIGRATION
R. D Christman Oct. 1981 14 p
(Contract W-7405-eng-36)
(DE82-004186; LA-9014-MS) Avail: NTIS HC A02/MF A01

The common files system is a hierarchical storge system consisting of fast disk, slower mass storage, and offline storage. The system uses a file migration program that analyzes file activity and automatically migrates files to storage devices that suit their usage history. Because of file migration, about 85% of files accessed and 30% of the data used are on the high speed disk. Despite the very large volume of offline data, only about 100 files per working day are loaded from offline storage. File migration has improved user response, optimized storage use, and minimized user costs. The common file system, the details of migration, operational considerations, and future work in the migration area are discussed. DOE

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support*.

N82-25838# New South Wales Univ., Kensington (Australia). School of Mathematics.
ON THE COMPUTATIONAL METHODS FOR THE OPTIMAL CONTROL OF DISTRIBUTED PARAMETER SYSTEMS Ph.D. Thesis
Donald W. Reid Mar. 1980 201 p refs
Avail: NTIS HC A10/MF A01

A class of optimal control problems of distributed parameter systems is considered. This class of optimal control problems arises naturally from a class of stochastic optimal control problems involving Ito stochastic differential equations. For systems governed by ordinary differential equations, the gradient search techniques and the strong variational techniques were used to obtain computational methods for finding optimal controls. These techniques and their theory are adapted to the class of distributed parameter systems under consideration. Certain known results concerning the control of distributed parameter and of stochastic systems are reviewed. The necessary conditions for optimality and the numerical techniques are emphasized. S.L.

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N82-25839# New South Wales Univ., Kensington (Australia). Dept. of Education.
FACTORS AFFECTING PERFORMANCE IN DIFFERENTIAL CALCULUS M.S. Thesis
David Burgess Sedgman 1980 275 p refs
Avail: NTIS HC A12/MF A01

Factors affecting high school students performance in differential calculus were studied using a series of independent variables, namely: test anxiety, locus of control, self concept, teacher efficiency, exam or ego condition, school variation, sex, intelligence and the eleventh grade final mark in mathematics. It was hypothesised that test anxiety, locus of conrol, and self concept would not predict differential calculus performance. The experimental results supported this hypothesis at the .01 level. Similarly, variables of sex intelligence did not predict differential calculus performance at the .01 level. The significant predictors of differential calculus (final mark, teaching efficiency and ego or exam condition) contributed a total of 48.4% of the score variance. The differential calculus test (reliability r = .83) was factor analysed to reveal nine interpretable mathematical factors which account for 57.9% of the variance. R.J.F.

N82-25840 National Physical Lab., Teddington (England). Div. of Information Technology and Computing.
PRACTICAL SPLINE APPROXIMATION
M. G. Cox Feb. 1982 36 p refs
(NPL-DITC-1/82; ISSN-0143-7348) Avail: NTIS HC A03/MF A01

The algorithmic aspects of spline interpolation and least squares spline approximation are introduced. Evaluation, differentiation and indefinite integration of spline interpolants and approximants are discussed. The use of a representation for splines of general order that affords a good balance between numerical stability and efficiency is considered. The systems of linear algebraic equations that arise in the construction of spline interpolants and approximants are solved. The matrices associated with these equations are banded, and the elimination and orthogonalization techniques described take full advantage of this structure. The advantages of representing splines as linear combinations of the truncated power functions, the B-splines, are demonstrated. Techniques for treating spline approximation problems that do not have unique solutions are presented, are strategies for automatic placement of the knots. Author (ESA)

N82-25841# Purdue Univ., Lafayette, Ind. School of Industrial Engineering.
POISSON RANDOM VARIATE GENERATION
Bruce Schmeiser and Voratas Kachitvichyanukul Dec. 1981 41 p refs
(Contract N00014-79-C-0832)
(AD-A111883; RR-81-4) Avail: NTIS HC A03/MF A01 CSCL 12/1

Approximate algorithms have long been the only available methods for generating Poisson random variates when the mean is large. A new algorithm is developed that is exact, has execution time insensitive to the value of the mean, and is valid whenever the mean is greater than 10. This algorithm is compared to the three other algorithms which have been developed recently for generating Poisson variates when the mean is large. Criteria used are set-up time, marginal execution time, memory requirements, and lines of code. New simple tight bounds on Poisson probabilities contribute to the speed of the algorithm, but are useful in a general context. In addition, Poisson variate generation is surveyed. Author (GRA)

N82-25842# Rochester Univ., N. Y. Graduate School of Management.
ROW-CONTINUOUS FINITE MARKOV CHAINS, STRUCTURE AND ALGORITHMS
J. Keilson, U. Sumita, and M. Zachmann Hanscom AFB, Mass. AFGL Mar. 1981 46 p refs
(Contract F19628-80-C-0003; Grants AF-AFOSR-0043-79; NSF ECS-79-1988; AF Proj. 6670)
(AD-A111805; AFGL-TR-81-0183; SCIENTIFIC-3) Avail: NTIS HC A03/MF A01 CSCL 12/1

For any finite bivariate Markov chain J(t), N(t) on state space for which row-continuity is present, i.e., N(t) changes by at most one at transitions, the ergodic distribution and mean passage times may be found by a simple algorithm. Related structure will be described. The procedure is based on probabilistic insights

associated with semi-Markov processes and birth-death processes. The resulting algorithms enable efficient treatment of chains with as many as 5000 = 50 x 100 states or more. Such bivariate chains are of importance to countless applied models in congestion theory, inventory theory, computer design, etc. The algorithm developed is to be used as a basis for calculating the distribution of the maximum of certain stationary meteorological processes over a specified interval. GRA

N82-25843# Stanford Univ., Calif. Systems Optimization Lab.

A PROCEDURE FOR COMPUTING FORWARD-DIFFERENCE INTERVALS FOR NUMERICAL OPTIMIZATION

Philip E. Gill, Walter Murray, Michael A. Saunders, and Margaret H. Wright Dec. 1981 31 p refs

(Contracts N00014-75-C-0267; DAAG29-81-K-0156; DE-AM02-76SF-00326; DAAG29-79-C-0110; DE-AT03-76ER-72018; Grants NSF MCS-79-26009; NSF ECS-80-12974)

(AD-A111627; SU-SOL-81-25; ARO-18424.4-M) Avail: NTIS HC A03/MF A01 CSCL 12/1

When minimizing a smooth nonlinear function whose derivatives are not available, a popular approach is to use a gradient method with a finite-difference approximation substituted for the exact gradient. In order for such a method to be effective, it must be possible to compute 'good' derivative approximations without requiring a large number of function evaluations. Certain 'standard' choices for the finite-difference interval may lead to poor derivative approximations for badly scaled problems. We present an algorithm for computing a set of intervals to be used in a forward-difference approximation of the gradient, and describe its implementation as a transportable FORTRAN subroutine. GRA

N82-25844# Wisconsin Univ. - Madison. Mathematics Research Center.

AN ANALYSIS OF TRANSFORMATIONS REVISITED, REBUTTED

G. E. P. Box and D. R. Cox (Imperial Coll. of Science and Technology, London) Oct. 1981 8 p refs

(Contract DAAG29-80-C-0041)

(AD-A110447; MRC-TSR-2288) Avail: NTIS HC A02/MF A01 CSCL 12/1

In a paper written in 1964, Box and Cox described a method for estimating transformations and showed how in suitable cases valuable increases in simplicity and efficiency were possible. Since that time, this technique has enjoyed wide practical use and considerable success. However, a recent theoretical paper by Bickel and Doksum (1981) seems to suggest that serious dangers are associated with the employment of this method, and speaks of 'instability' and 'cost' of estimation of the transformation. These difficulties seem to be associated with (1) examples which common sense would rule out, namely situations where the effect of transformation on the data is almost linear, so that it is a matter of indifference which transformation is used; (2) the idea that it makes sense to state conclusions in terms of a number measured on an arbitrary scale; (3) failure to take proper account of the Jacobian of the transformation. GRA

N82-25845# Wisconsin Univ. - Madison. Mathematics Research Center.

IMPROVED SUDAKOV-TYPE BOUNDS FOR OPTIMAL CONFIDENCE LIMITS ON THE RELIABILITY OF SERIES SYSTEMS

Bernard Harris and Andrew P. Soms Oct. 1981 15 p refs

(Contracts N00014-79-C-0321; DAAG29-80-C-0041)

(AD-A110451; MRC-TSR-2294) Avail: NTIS HC A02/MF A01 CSCL 12/1

A sharper Sudakov-type lower bound for the lower confidence limit on the reliability of a series system than the one given in Harris and Soms (1980) is obtained. Numerical examples, coverage probabilities and the listings of the short FORTRAN programs used are also provided. Author (GRA)

N82-25846# Wisconsin Univ. - Madison.

HIGH ORDER CONTINUITY IMPLIES GOOD APPROXIMATIONS TO SOLUTIONS OF CERTAIN FUNCTIONAL EQUATIONS

T. N. T. Goodman, I. J. Schoenberg, and A. Sharma Nov. 1981 29 p refs

(Contract DAAG29-80-C-0041)

(AD-A110453; MRC-TSR-2296) Avail: NTIS HC A03/MF A01 CSCL 12/1

An entire function of exponential type A < 2 Pi is shown that there is a unique entire function f(x) of exponential type A satisfying a certain functional equation. An apparently new principle is described for generating polynomial approximations in 0 = or < X < or = 1 to the solutions of certain functional equations. GRA

N82-25847# Wisconsin Univ. - Madison. Mathematics Research Center.

A NEW APPROACH TO EULER SPLINE. 1

I. J. Schoenberg Nov. 1981 21 p refs

(Contract DAAG29-80-C-0041)

(AD-A110456; MRC-TSR-2299) Avail: NTIS HC A02/MF A01 CSCL 12/1

Starting from the exponential Euler polynomials discussed by Euler, the author previously introduced the so-called exponential Euler splines. This report describes a new recursive construction of these exponential Euler splines. GRA

N82-25848# Wisconsin Univ. - Madison. Mathematics Research Center.

BORSUK-ULAM THEOREMS FOR ARBITRARY S1 ACTIONS AND APPLICATIONS

E. R. Fadell, S. Y. Husseini, and P. H. Rabinowitz Nov. 1981 30 p refs

(Contract DAAG29-80-C-0041; Grant NSF MCS-81-10556)

(AD-A110458; MRC-TSR-2301) Avail: NTIS HC A03/MF A01 CSCL 12/1

An S to the first power version of the Borsuk-Ulam Theorem is proved for a situation where Fix S to the first power may be nontrivial. The proof is accomplished with the aid of a new relative index theory. Applications are given to intersection theorems and the existence of multiple critical points is established for a class of functionals invariant under an S to the first power symmetry. Minimax arguments from the calculus of variations serve as an important tool in establishing the existence of nonlinear vibrations of discrete mechanical systems as modeled by Hamilton's equations. In these arguments one obtains the solutions of the differential equations as critical points of an associated Lagrangian by minimaxing the Lagrangian over appropriate classes of sets. Intersection theorems such as are proved in this paper play a crucial role in this process. In addition to obtaining some intersection theorems this report illustrates their use by proving an existence theorem for multiple critical points of the functional invariant under an S to the first power symmetry group. GRA

N82-25849# Wisconsin Univ. - Madison. Mathematics Research Center.

AN ALGORITHM FOR STRUCTURED, LARGE-SCALE QUADRATIC PROGRAMMING PROBLEMS

CuDuong Ha (Virginia Commonwealth Univ.) Sep. 1981 31 p refs

(Contract DAAG29-80-C-0041)

(AD-A110463; MRC-TSR-2276) Avail: NTIS HC A03/MF A01 CSCL 12/1

An algorithm for structured, large-scale, convex quadratic programming problems is described. The structure of the constraint matrix is block diagonal with a small number of coupling constraints and variables. The algorithm utilizes twice a decomposition procedure that was developed earlier. The first time the decomposition procedure is used to break up the coupling constraints, and the second time it is used to break up the coupling variables. Preliminary computational results are also reported. The block diagonal structure with a small number of coupling constraints and variables usually arises from the formulation of multitime period and multidivision production scheduling and distribution models in large corporations. Each block is concerned with the operation of one division during one time period considered in isolation. The coupling constraints arise from the use of common resources of all divisions or from combining the output of divisions to meet overall demands. The coupling variables represent activities that affect the operation of divisions in more than one time period. GRA

N82-25850# Wisconsin Univ. - Madison. Mathematics Research Center.

NONLINEAR PARABOLIC EQUATIONS INVOLVING MEASURES AS INITIAL CONDITIONS

Haim Brezis and Avner Friedman Sep. 1981 38 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-79-15171)
(AD-A110464; MRC-TSR-2277) Avail: NTIS
HC A03/MF A01 CSCL 12/1

The Cauchy problem is considered for certain equations with a boundary condition and an initial condition. A solution of the equations exists if and only if $0 < p < n+2/n$. This paper deals with the question of existence (and uniqueness) when the initial data is a measure, for example a Dirac mass. Physically this corresponds to the important case when the initial temperature (or initial density etc. ..) is extremely high near one point. The main novelty of this paper is to show that a solution exists only under some severe restrictions on the parameter P (or m); namely P must be less than $n+2/n$ ($m>n+2/n$). For example, one striking conclusion reached is the fact that an equation possesses no solution in any dimension $n >$ or $= 1$ and on any time interval (O,T). This result pinpoints the sharp contrast between linear and nonlinear equations from the point of view of existence. GRA

N82-25851# Wisconsin Univ. - Madison. Mathematics Research Center.

PERIODIC SOLUTIONS OF LARGE NORM OF HAMILTONIAN SYSTEMS

Paul H. Rabinowitz Sep. 1981 25 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-81-10556)
(AD-A110465; MRC-TSR-2278) Avail: NTIS
HC A02/MF A01 CSCL 12/1

Hamiltonian systems of ordinary differential equations model the motion of a discrete mechanical system. This paper considers a class of such systems assuming only suitably rapid growth for the Hamiltonian near infinity. Minimax and comparison arguments from the calculus of variations are then used to show that for any prescribed period, there exist arbitrarily large solutions of the system having the given period. GRA

N82-25852# Wisconsin Univ. - Madison. Mathematics Research Center.

NOMOGRAPHIC FUNCTIONS ARE NOWHERE DENSE

R. Creighton Buck Sep. 1981 13 p refs
(Contract DAAG29-80-C-0041)
(AD-A110466; MRC-TSR-2279) Avail: NTIS
HC A02/MF A01 CSCL 12/1

An important topic in approximation theory is the study of ways to approximate complicated functions of many variables by combinations of simpler functions. One important type of the latter are the nomographic functions, which can be written entirely in terms of addition and functions of one variable. The present paper shows that these are inherently a very sparse subset of the class of all continuous functions; this places a severe limitation upon their use as single functions, but not if they are added together. GRA

N82-25853# Wisconsin Univ. - Madison. Mathematics Research Center.

THE RIEMANN PROBLEM FOR THE U SUB T + SIGMA SUB X = 0 AND (SIGMA - F (U)) SUB T + (SIGMA - MU F (U)) = 0

J. M. Greenberg and Ling Hsiao Sep. 1981 28 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-80-18531)
(AD-A110468; MRC-TSR-2281) Avail: NTIS
HC A03/MF A01 CSCL 12/1

In this paper we study the Riemann Problem for a system of conservation laws which exhibit internal friction similar to that seen in viscoelastic solids of the maxwell type. The solutions we obtain have a single shock and a single contact discontinuity and off of these singular curves they are smooth. The results we obtain are two fold. First we show this problem is globally solvable in time; this requires precise a-priori estimates for the solution off of the singular curves. Secondly, we obtain asymptotic or large time information about the solution which guarantees that in a weak sense it converges to special traveling wave solutions of the equations with compatible data. Author (GRA)

N82-25854# Wisconsin Univ. - Madison. Mathematics Research Center.

A FREE-BOUNDARY PROBLEM FOR A DEGENERATE PARABOLIC SYSTEM

R. E. Showalter Sep. 1981 30 p refs
(Contract DAAG29-80-C-0041)
(AD-A110469; MRC-TSR-2282) Avail: NTIS
HC A03/MF A01 CSCL 20/13

The degenerate parabolic system (1.1) in the introduction, serves as a model for heat conduction in a heterogeneous medium consisting of two components. The first component is made up of small pieces suspended in the second component, and the second component undergoes a change of phase at a prescribed temperature. This phenomenon occurs in a mixture of gravel and wet soil (for example, melting of frozen soil). Existence and uniqueness results of weak solutions of the degenerate parabolic problem are shown by employing monotone operator theory. Local regularity, such as continuity and boundedness of the solution is studied. A discussion is provided about the mutual interplay of the thermodynamic temperature (the temperature in the first component) and the conductive temperature (the temperature in the second component). Author (GRA)

N82-25855# Wisconsin Univ. - Madison. Mathematics Research Center.

THE ASYMPTOTIC BEHAVIOR OF A FREE BOUNDARY ARISING FROM A BISTABLE REACTION-DIFFUSION EQUATION

David Terman Sep. 1981 19 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-80-17158)
(AD-A110470; MRC-TSR-2283) Avail: NTIS
HC A02/MF A01 CSCL 12/1

The mathematical equation studied here has been considered as a model for a variety of physical phenomena including population genetics and nerve conduction. Of primary interest is the eventual behavior of solutions of this equation. One expects that for sufficiently large initial datum the solutions should eventually look like some type of wave traveling with constant shape and velocity. In the case of nerve conduction, for example, the initial datum may correspond to a stimulus applied to the nerve axon. Physiologically, it has been demonstrated that if this stimulus is greater than some threshold amount, then a signal will propagate down the axon with a speed independent of the initial stimulus. In this paper we demonstrate that the equation under study supports solutions exhibiting similar behaviors. Author (GRA)

N82-25856# Naval Research Lab., Washington, D. C.

THE PALEY-WIENER CRITERION FOR RELAXATION FUNCTIONS Interim Report

K. L. Ngai, A. K. Rajagopal, R. W. Rendell, and S. Teitler 2 Mar. 1982 11 p refs
(NR Proj. 318-059)
(AD-A111450; NRL-MR-4764) Avail: NTIS
HC A02/MF A01 CSCL 12/1

It is shown that a rigorous mathematical theorem in the theory of Fourier transforms due to Paley and Wiener provides the bound for physically acceptable relaxation functions for long times. The exponential decay function, exp(-t/tau), with a constant relaxation time tau, and hence also a superposition of exponential decay functions corresponding to a distribution of relaxation times, does not provide an acceptable description of relaxation phenomena. On the other hand, the assumable bound of the Paley-Wiener theorem does. This bound turns out to have exactly the same form as a class of relaxation functions that have been successfully applied in the description of many relaxation phenomena in condensed matter. An important consequence of the Paley-Wiener theorem is the necessity for time-dependent relaxation rates which provides insight into the reason for deviation from exponential behavior for long times. Author (GRA)

N82-25857*# Stanford Univ., Calif. Dept. of Computer Science.

GROUP VELOCITY INTERPRETATION OF THE STABILITY THEORY OF GUSTAFSSON, KREISS AND SUNDSTROEM

Lloyd N. Trefethen Dec. 1981 21 p refs Submitted for publication
(Contracts NCA2-OR745-004; N00014-75-C-1132)

(AD-A111010; NASA-CR-168695; NAS 1.26:168695; NA-81-18) Avail: NTIS HC A02/MF A01 CSCL 12/1

The existing stability theory for finite difference models of hyperbolic initial boundary value problems, due to Gustafsson, Kreiss, and Sundstroem, is difficult to understand in its original algebraic formulation. Here we show that the GKS stability criterion has a physical interpretation in terms of group velocity: if the finite difference model together with its boundary conditions can support a set of waves at the boundary with group velocities pointing into the field, then it is unstable. A simple argument explains why such a set of waves is unstable, and yields a new theorem on what kind of unstable growth to expect. We give examples in one and two space dimensions. Author (GRA)

N82-25858# Stanford Univ., Calif. Systems Optimization Lab.

POLYNOMIAL LOCAL IMPROVEMENT ALGORITHMS IN COMBINATORIAL OPTIMIZATION

Craig Aaron Tovey Nov. 1981 68 p refs

(Contracts N00014-75-C-0267; DAAG29-79-C-0110; DE-AM03-76SF-00326; DE-AT03-76ER-72018; Grants NSF MCS-76-81259; NSF MCS-79-26009; NSF ECS-8-12974; NR Proj. 047-143)

(AD-A110845; SU-SOL-81-21; ARO-18424.1-M) Avail: NTIS HC A04/MF A01 CSCL 12/1

The subject of this report is an analysis of the expected, or average case performance of local improvement algorithms. The first chapter presents the basic model, defines the combinatorial structures which are the basis for the analysis, and describes the randomness assumptions upon which the expectation are based. The second chapter examines these structures in more detail, including an analysis of both best and worst case performance. The third chapter discusses simulation results which predict an approximately linear average case performance, and proves an O(n2 log n) upper bound for two of the random distributions assumed. Chapter Four proves some extensions and sharper versions of this upper bound. The fifth chapter applies the model to principal pivoting algorithms for the linear complementarity problem, and to the simplex method. Although local improvement is not guaranteed to find a global optimum for all problems, most notably those that are NP-complete, it is nonetheless often used in these cases. Chapter Six discusses these applications. GRA

N82-25859# Stanford Univ., Calif. Systems Optimization Lab.

OPTIMAL APPROXIMATION OF SPARSE HESSIANS AND ITS EQUIVALENCE TO A GRAPH COLORING PROBLEM

S. Thomas McCormick Nov. 1981 23 p refs

(Contracts N00014-75-C-0267; DAAG29-79-C-0110; DE-AM03-76SF-00326; DE-AT03-76ER-72018; Grants NSF MCS-76-81259; NSF MCS-79-26009; NSF ECS-80-12974) (AD-A110846; SU-SOL-81-22; ARO-18424.2-M) Avail: NTIS HC A02/MF A01 CSCL 12/1

We consider the problem of approximating the Hessian matrix of a smooth non-linear function using a minimum number of gradient evaluations, particularly in the case that the Hessian has a known, fixed sparsity pattern. We study the class of Direct Methods for this problem, and propose two new ways of classifying Direct Methods. Examples are given that show the relationships among optimal methods from each class. The problem of finding a non-overlapping direct cover is shown to be equivalent to a generalized graph coloring problem -the distance-2 graph coloring problem. A theorem is proved showing that the general distance-k graph coloring problem is NP-Complete for all fixed k equal to or greater than 2, and hence that the optimal non-overlapping direct cover problem is also NP-Complete. Some worst-case bounds on the performance of a simple coloring heuristic are given. An appendix proves a well known folklore result, which implies as a corollary that another class of methods, the Elimination Methods, includes optimal polynomially-bounded algorithms. GRA

N82-25860# Pittsburg Univ., Pa. Inst. for Computational Mathematics and Applications.

A PROGRAM FOR A LOCALLY-PARAMETRIZED CONTINUATION PROCESS

Werner C. Rheinboldt and John V. Burkardt Oct. 1981 65 p refs

(Contract N00014-77-C-0623; Grant NSF MCS-78-05299) (AD-A110584; ICMA-81-30) Avail: NTIS HC A04/MF A01 CSCL 12/1

The study of many equilibrium phenomena leads to non-linear equations which involve a number of intrinsic parameters. Interest then centers rarely on the determination of a few specific solutions of the equations for fixed parameter values but rather on an assessment of the behavior of these solutions under general variations of the parameters. For example, in structural analysis the parameters may characterize load points and load directions, material properties, geometrical data, etc. The set of all solutions and associated parameter values has been called the equilibrium surface of the structure. This equilibrium surface provides considerable insight into the behavior of the structure and the stability properties. From a numerical viewpoint the question then is to analyze computationally the shape and characterize particular features of this equilibrium surface. GRA

N82-25861# Wisconsin Univ. - Madison. Dept. of Statistics.

CONSTRAINED REGULARIZATION FOR WITH APPLICATIONS IN METEOROLOGY AND MEDICINE

Grace Wahba Aug. 1981 45 p refs Submitted for publication

(Contract N00014-77-C-0675)

(AD-A110769; TR-646) Avail: NTIS HC A03/MF A01 CSCL 12/1

The relationship between certain regularization methods for solving ill posed linear operator equations and ridge methods in regression problems is described. The regularization estimates we describe may be viewed as ridge estimates in a (reproducing kernel) Hilbert space H. When the solution is known a priori to be in some closed, convex set in H, for example, the set of nonnegative functions, or the set of monotone functions, then one can propose regularized estimates subject to side conditions such as nonnegativity, monotonicity, etc. Some applications in medicine and meteorology are described. We describe the method of generalized cross validation for choosing the smoothing (or ridge) parameter in the presence of a family of linear inequality constraints. Some successful numerical examples, solving ill posed convolution equations with noisy data, subject to nonnegativity constraints, are presented. The technique appears to be quite successful in adding information, doing nearly the optimal amount of smoothing, and resolving distinct peaks in the solution which have been blurred by the convolution operation. Author (GRA)

N82-25862# Defense Mapping Agency Aerospace Center, St. Louis, Mo.

GEODETIC DATUM TRANSFORMATION BY MULTIPLE REGRESSION EQUATIONS Final Report

Lawrence T. Appelbaum Feb. 1982 15 p refs Presented at the 3rd Intern. Geodetic Symp., Las Cruces, N.M., 8-12 Feb. 1982

(AD-A110864) Avail: NTIS HC A02/MF A01 CSCL 12/1

A computer program incorporating the least squares stepwise multiple regression procedure has been used to derive polynomial equations for converting coordinates from one geodetic datum to another (datum shifts) as a function of latitude and longitude. Reference coordinate differences throughout the geographic area or datum are used for the regression. Therefore, the regression exhibits sensitivity to regional variations in the coordinate differences. (These variations are closely related to changes in the geodetic control in localized areas.) The resulting equations reflect this in precision. Contrariwise, the traditionally used Molodensky Coordinate Transformation Formulas, as conventionally applied over a geographic area, utilize area average rectangular coordinate differences delta X, delta Y, delta Z. Author (GRA)

N82-25863# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.

EXPLICIT DIFFERENCE SCHEMES FOR WAVE PROPAGATION AND IMPACT PROBLEMS

Joseph E. Flaherty Jan. 1982 31 p refs

(Grant AF-AFOSR-0192-80; DA Proj. 1L1-61102-BH-57)

(AD-A111448; ARLCB-TR-82001) Avail: NTIS HC A03/MF A01 CSCL 12/1

Explicit finite difference and finite element schemes are

constructed to solve wave propagation, shock and impact problems. The schemes rely on exponential functions and the solution of linearized Riemann problems in order to reduce the effects of numerical dispersion and diffusion. The relationship of the new schemes to existing explicit schemes is analyzed and numerical results and comparisons are presented for several examples. Author (GRA)

N82-25864*# Brown Univ., Providence, R. I. Div. of Applied Mathematics.

SPLINE APPROXIMATIONS FOR LINEAR NONAUTONOMOUS DELAY SYSTEMS

H. Thomas Banks and I. Gary Rosen (Bowdoin College) 9 Oct. 1981 63 p refs

(Contracts NAS1-15810; NAS1-16394; DAAG29-79-C-0161; AF-AFOSR-0198-81; Grant NSF MCS-79-05774-02) (NASA-CR-168694; AD-A111111; NAS 1.26:168694; Rept-81-33; AFOSR-82-0035TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

A semi-discrete approximation framework for linear nonautonomous nonhomogeneous functional differential equations of retarded type was developed. The approximation schemes were constructed and convergence results were obtained through the approximation of an associated abstract evolution operator. Computer implementation of the schemes is outlined and a spline based method included in the framework is constructed. Extensions of the semi-discrete methods to schemes incorporating full discretization and difference equation approximation are also discussed. Numerical results for several examples demonstrating the feasibility of the schemes are presented. Author (GRA)

N82-25865# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Statistics.

AN ALGORITHM FOR ESTIMATION IN SIMULTANEOUS LOGIT MODELS

Michael M. Meyer Dec. 1981 20 p refs

(Contract N00014-80-C-0637)

(AD-A111015; TR-226) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper uses a very general version of the Iterative Proportional Fitting Procedure to develop an algorithm for estimation in simultaneous logit models. The algorithm can be used for any loglinear model which can be cast in the form of simultaneous logit equations. The principal advantage of this method is that it is not necessary to fit parameters associated with the sampling constraints and thus very large problems can be attacked. A numerical example using GLIM and a sample GLIM macro are included. Author (GRA)

N82-25866# Cornell Univ., Ithaca, N. Y. Dept. of Structural Engineering.

FINITE ELEMENT ANALYSIS OF MAGNETOELASTIC PLATE PROBLEMS Technical Report, Feb. 1979 - Aug. 1981

K. Y. Yuan Aug. 1981 247 p refs

(Contract N00014-79-C-224; NR Proj. 064-621)

(AD-A111012; Rept-81-14) Avail: NTIS HC A11/MF A01 CSCL 12/1

Magnetic forces acting on conducting metal structures are significant in the design of such devices as fusion reactors, magnetohydrodynamic generators, magnetically levitated vehicles, magnetic forming devices, and various electric machines. The magnetic loads on these structures may be pulsed or cyclical and arise from the interaction between the induced eddy currents in the conductor and the externally applied magnetic fields. Moreover, the velocity and finite deformation of the conducting structure may interact with the electromagnetic fields to yield a coupled problem. This thesis presents an integrated study of magnetoelasticity problems for thin nonferrous conducting plates. Three phases of the study have been emphasized: theoretical modelling of interaction problems, finite element eddy current calculations for rigid conducting plates, and finite element numerical studies of coupled magnetoelastic problems. Experimental results by others and analytical solutions for limiting cases have been used to verify the numerical results obtained at each stage of the investigation. The FORTRAN programs developed for each part of the study are also described. The electrodynamics and continuum mechanics bases of the problem are presented in the modelling part of the study. GRA

N82-25867# Maryland Univ., College Park. Dept. of Mathematics.

LECTURES ON THE NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS

I. Babuska, ed., T.-P. Liu, ed., and J. Osborn, ed. Dec. 1981 604 p refs Proceedings of the Spec. Yr. in Numerical Analysis, College Park, Md., 1980-1981

(Grant AF-AFOSR-0251-80; AF Proj. 2304)

(AD-A110966; AFOSR-82-0047TR; MU-LN-20) Avail: NTIS HC A99/MF A01 CSCL 12/1

Contents: Adapting Courant-Friedrichs-Levy to the 1980's; Parametrization Methods for Approximation of Solutions of Elliptic Boundary Value Problems; Two Mixed Finite Element Methods for the Simply Supported Plat Problem; Approximation of Non-linear Problems; Two dimensional Approximations of Three dimensional Models in Nonlinear Plate Theory; Changing Meshes in Time-dependent Problems; Alternating-direction Galerkin Methods for Parabolic Hyperbolic and Sobolev Partial Differential Equations; Galerkin Methods for Miscible Displacement Problems with Point Sources and Sinks-Unit Mobility Ratio Case; Overtaking of Shock Waves in Steady Two-dimensional Supersonic Flows; Homogenization, Convex Analysis, and the Geometry Optimization of Engineering Structures; Stability and Error Bounds for a Fractional Step Scheme to Compute Weak Solutions of the Nonlinear Waterhammer Problem; Schauder Estimates for Finite Element Approximations of Second Order Elliptic Boundary Value Problems; Analysis of Some Contact Problems in Nonlinear Elasticity; Single Step Methods for Linear Differential Equations in Banach Spaces; The Quasi-optimality in the Maximum Norm of the H1 Projection into Piecewise Linear Functions in the Plane: a Complete Proof (Second lecture); A Brief Survey of Parabolic Smoothing and How It Affects a Numerical Solution: Finite Differences and Finite Elements (Third lecture); Integral Equation Methods for Mixed Boundary Value Problems (Second lecture). GRA

N82-25868# Arizona Univ., Tucson. Dept. of Aerospace and Mechanical Engineering.

BALANCED ARRAY PROCESSOR CONFIGURATIONS FOR FINITE ELEMENT ANALYSIS

J. Maitan, N. Sarigul, O. Palusinski, and H. Kamel 15 Feb. 1982 17 p refs Presented at INIRA, Le Chesnay, France, 12-14 Dec. 1981

(Contract N00014-75-C-0837; NR Proj. 064-531)

(AD-A111262; TR-9) Avail: NTIS HC A02/MF A01 CSCL 09/2

The paper proposes the use of the kernel control decomposition of algorithms as an aid to the efficient implementation of finite element computing procedures on a minicomputer-array process system. A theoretical treatment and three examples are given. Author (GRA)

N82-25869# California Univ., San Diego. Dept. of Mathematics.

DECONVOLUTION AND ESTIMATION OF TRANSFER FUNCTION PHASE AND COEFFICIENTS FOR NONGAUSSIAN LINEAR PROCESSES

K. S. Lii and M. Rosenblatt 4 Nov. 1981 48 p refs

(Contract N00014-81-K-0003)

(AD-A111664) Avail: NTIS HC A03/MF A01 CSCL 12/1

NonGaussian linear processes are considered. It is shown that the phase of the transfer function can be estimated under broad conditions. This is not true of Gaussian linear processes and in this sense Gaussian linear processes are a typical. The asymptotic behavior of a phase estimate is determined. The phase estimates make use of bispectral estimates. These ideas are applied to a problem of deconvolution which is effective even when the transfer function is not minimum phase. A number of computational illustrations are given. Author (GRA)

N82-25870# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation.

PAINLEVE EQUATIONS AND THEIR CONNECTION WITH NONLINEAR EVOLUTION EQUATIONS, PART 2

L. A. Bordag 1980 19 p refs

(JINR-E-5-80-477-Pt-2) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The third and fifth Painleve equations are studied. Results

of investigations of general and partial solutions of the Painleve equations P3 and P5 are summarized. Families of the partial solutions of the equations P3 and P5 are described. The Backlund transformations for the equations P3 and P5 and the connection between solutions of these equations are given. DOE

N82-25871# Niels Bohr Inst., Copenhagen (Denmark).
FEYNMAN GRAPH DERIVATION OF EINSTEIN QUADRUPOLE FORMULA
N. D. H. Dass and V. Soni (Madras Univ., India) Nov. 1980 64 p refs
(NBI-HE-80-46) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

The one graviton transition operator, and consequently, the classical energy loss formula for gravitational radiation were derived from the Feynamn graphs of helicity + or - 2 theories of gravitation. The calculations were done both for the case of electromagnetic and gravitational scattering. The departure of the in and out states from plane waves owing to the long range nature of gravitation was taken into account to improve the Born approximation calculations. This also includes a long range modification of the gravitation wave function which is shown to be equivalent to the classical problem of the true light cones deviating logarithmically at large distances from the flat space light cones. The transition from the S-matrix elements calculated graphically to the gravition transition operator is done by using complimentarity of space-time and momentum descriptions. The energy loss formula derived originally by Einstein is shown to be correct. DOE

N82-25872# Niels Bohr Inst., Copenhagen (Denmark).
CANONICAL STRUCTURE OF SOLITON EQUATIONS. 2: 3X3 AND NXN PROBLEMS
J. M. Alberty, T. Koikawa, and R. Sasaki Aug. 1980 48 p refs
(NBI-HE-80-29) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The canonical structure of the general nonlinear evolution equations solvable in terms of the 3x3 and NxN inverse scattering problems is discussed. Discussion of the various possible reductions of the number of dependent variables by imposing constraints consistent with the Hamiltonian flows are given together with the canonical structure of the reduced systems. DOE

N82-25873# Niels Bohr Inst., Copenhagen (Denmark).
CANONICAL STRUCTURE OF SOLITON EQUATIONS. 4: THE KAUP-NEWELL SYSTEM
R. Sasaki (Utrecht Univ., Netherlands) Aug. 1980 24 p refs Sponsored by the Danish Research Council
(NBI-HE-80-32) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The canonical structure of the Kaup-Newell system, i.e., the family of the derivative nonlinear Schroedinger equation and its generalizations is discussed. DOE

N82-25874# Institut Fiziki Vysokikh Energii, Serpukhov (USSR).
NEW CLASS OF THE FACTORIZED S MATRIX AND TRIANGLE EQUATIONS
V. V. Bazhanov and Yu. G. Stroganov 1980 9 p refs Submitted for publication
(IFVE-OTF-80-131) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

General properties of triangle equations and new solutions are discussed. The factorized S matrix for the theory containing one neutral and (N-1) charged particles with conserved (modulo N) quantum number was constructed. It is found that the partition function for corresponding plane square lattice statistical model is exactly calculable. DOE

N82-25875# Los Alamos Scientific Lab., N. Mex.
ON THE NOTION OF ANALOGY AND COMPLEXITY IN SOME CONSTRUCTIVE MATHEMATICAL SCHEMATA
S. M. Ulam Oct. 1981 15 p refs Submitted for publication (Contract W-7405-eng-36)
(DE82-002473; LA-9065-MS) Avail: NTIS HC A02/MF A01

Problems in statistical mechanics and in number theory, are exhibited for the role of the ideas of probability analogous in these two domains which are so far apart. An elementary approach to the notion of analogy is presented and a few mathematical problems are pointed out namely, similarity or proximity of proofs and counting binary and unary operations at each stage with similar trees on the set of axioms. DOE

N82-25876# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Applied Mathermatics.
EXISTENCE AND UNIQUENESS FOR A NONLINEAR DIFFUSION PROBLEM ARISING IN NEUROPHYSIOLOGY
Joop P. Pauwelussen Aug. 1981 28 p refs Submitted for publication
(MC-TW-217/81) Avail: NTIS HC A03/MF A01

Existence and uniqueness for a nonlinear reaction-diffusion problem, which arises in neurophysiology as a model for impulse propagation along nonuniform nerve axons, were verified. The qualitative behavior of solutions of a system of equations was examined. Let u sub t = e sub epsilon of (x) u sub (xx) + F(u, w,); w sub t = G(u, w), x belongs to the set of all real numbers solidus open braces zero close braces, t > zero where e sub epsilon of (x) = the operator (1 : x < or = zero) to (epsilon : x > zero), and where (u, w) takes on values in (the set of all real numbers) (the set of real numbers sup n) for some n > zero, with F and G Lipschitz continuous in u and w. This system was treated in the framework of an initial value problem with initial conditions. Author (ESA)

N82-25877# National Inst. for Metallurgy, Randburg (South Africa). Analytical Chemistry Div.
FIVE ROBUST INDICATORS OF CENTRAL VALUE
P. J. Ellis 14 Aug. 1981 23 p refs In ENGLISH; AFRIKAANS summary
(PB82-133109; NIM-2121; ISBN-0-869999-549-9) Avail: NTIS HC A02/MF A01 CSCL 12A

The presence of outliers and the statistical noise that affects the data for reference materials have undesirable effects on the mean and on other indicators of the central value. Five robust indicators of the central value, which are resistant to obvious outliers and less obvious contamination (spurious data), were investigated: the dominant cluster mode, the modian, the Gastwirth median, the trimean, and the trimmed mean. The mean and the median were investigated for purposes of comparison. The results confirm that the mean is very unreliable, and that the Gastwirth median and the dominant cluster mode are strong indicators of the central value. Author (GRA)

N82-25560*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOLUTION OF LINEAR SYSTEM OF EQUATIONS WHEN THE MATRIX IS CIRCULANT
R. C. Balgovind *In its* Modeling and Simulation Facility: Res. Rev., 1980 - 1981 Dec. 1981 p 71-73 refs (For primary document see N82-25551 16-42)
Avail: NTIS HC A10/MF A01 CSCL 12A

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N82-25878# Council for Scientific and Industrial Research, Pretoria (South Africa).
ON A POSTERIORI PROBABILITY
F. Bing 1981 25 p refs Transl. into ENGLISH from Tidsskrift for Math., v. 3, no. 4, 1879 p 1-22
(CSIR-Trans-1612) Avail: NTIS HC A02/MF A01

It is demonstrated that there is no such thing as a posteriori probability in problems in which no information is available about causes. Differing applications of Bayes's Theorem are explored. R.J.F.

N82-25879# Ohio State Univ., Columbus. Computer and Information Science Research Center.
A SURVEY OF PARALLEL SORTING ALGORITHMS
David J. DeWitt, Dina Friedland, David K. Hsiao, and M. Jaishankar Menon Dec. 1981 58 p refs Prepared in cooperation with

Wisconsin Univ., Madison
(Contracts N00014-75-C-0573; DAAG29-79-C-0165; DAAG29-75-C-0024; Grant NSF MCS-78-0172)
(AD-A111748; OSU-CISRC-TR-81-11; LPN-OSURF-4115-A1) Avail: NTIS HC A04/MF A01 CSCL 12/1

A rather comprehensive survey of parallel sorting algorithms is included herein. Parallel sorting algorithms are considered in two major categories - the internal parallel sorting algorithms and the external parallel sorting algorithms. Because external sorting algorithms are important to the database applications, considerable emphases are made in the motivation and analysis of the external parallel sorting algorithms surveyed in the report. In particular, the authors of this report have conducted research in external parallel sorting algorithms and made some important contributions. Their findings are also reported herein.
Author (GRA)

N82-25880# Pennsylvania Univ., Philadelphia. Dept. of Mathematics and Statistics.
ASYMPTOTIC DISTRIBUTIONS OF THE LIKELIHOOD RATIO TEST STATISTICS FOR COVARIANCE STRUCTURES OF THE COMPLEX MULTIVARIATE NORMAL DISTRIBUTION
C. Fang, P. R. Krishnaiah, and B. N. Nagarsenker (Air Force Inst. of Technology, Wright-Patterson AFB, Ohio) Sep. 1981 43 p refs
(Contract F49620-79-C-0161; AF Proj. 2304)
(AD-A111166; RR-81-30; AFOSR-81-0766TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

In this paper, the authors obtained asymptotic expressions for the null and nonnull distributions of the likelihood ratio test statistic for multiple independence when the underlying distribution is complex multivariate normal. The authors also derived asymptotic null distribution of the likelihood ratio test statistic for homogeneity of the covariance matrices of several complex multivariate normal populations; asymptotic expressions are also obtained for the nonnull case when we have two populations. The expressions obtained in this paper are in terms of beta series.
Author (GRA)

N82-25881# Stanford Univ., Calif. Inst. for Mathematical Studies in the Social Sciences.
PARADOXICAL RESULTS FROM INADA'S CONDITIONS FOR MAJORITY RULE
Herve Raynaud (Inst. de Recherches en Mathematiques Avancees, Grenoble, France) Mar. 1981 25 p refs
(Contract N00014-79-C-0685)
(AD-A111670; SU-TR-331) Avail: NTIS HC A02/MF A01 CSCL 12/1

The conclusion of this paper however paradoxical is simple: Arrow-Black's and Inada's conditions on triples do not allow more diversity individual orders than the more restrictive looking Black's condition with a reference order. If one considers that the culture imposes one of these conditions to the individual, and that a measure of his freedom consists in the number of different opinions he is allowed to have (in order to have the right to vote), no more is offered by the conditions on triples only.
GRA

N82-25882# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
STATE ESTIMATION OF A HYBRID MARKOV PROCESS WITH APPLICATION TO MULTITARGET TRACKING M.S. Thesis
Franck E. Bruneau Jan. 1982 145 p refs
(Contract N00014-77-C-0532; NR Proj. 041-519)
(AD-A111728; LIDS-TH-1172; LPN-MIT-OSP-85552) Avail: NTIS HC A07/MF A01 CSCL 12/1

Many estimation problems, including failure detection and multitarget tracking, rely on the state estimation of a hybrid Markov process. An algorithm for estimating the state sequence of such a process must keep the amount of computation at a reasonable level. Techniques are derived for reducing the computational burden, that do not increase the error probability. In a multiple system case, the concept of clustering, which greatly diminished the computational complexity, can be applied without loss of optimality under precise conditions. For the application to multitarget tracking, the computation of an optimal grating is done.
Author (GRA)

N82-25883# Michigan State Univ., East Lansing. Dept. of Statistics and Probability.
A NONPARAMETRIC ESTIMATOR OF THE SURVIVAL FUNCTION UNDER PROGRESSIVE CENSORING
Joseph C. Gardiner and V. Susarla (State Univ. of N.Y., Binghampton) 1 Dec. 1981 18 p refs
(Contract N00014-79-C-0522; Grants NIGMS-G-1-R01-GM-28030; NIGMS-G-1-R01-GM-28405)
(AD-A111859) Avail: NTIS HC A02/MF A01 CSCL 12/1

A nonparametric estimator of the survival function F is constructed from time-sequential progressively censored data when F is a Dirichlet process. The estimator is shown to encompass several known estimators of F including the product-limit estimator and Ferguson's estimator.
Author (GRA)

N82-25884# Naval Biodynamics Lab., New Orleans, La.
STATISTICAL ISSUES IN PERFORMANCE TESTING: COLLECTED PAPERS
Sep. 1981 31 p refs
(AD-A111086; NBDL-81R010) Avail: NTIS HC A03/MF A01 CSCL 05/10

This is a collection of papers about various statistical issues that arise in human performance testing. Two papers by M. B. Jones discuss practice-associated changes of individual differences in test performance. A. C. Bittner, Jr., and R. H. Shannon each present ideas about how to assess whether there is any practice-associated change of individual differences. R. C. Carter proposes the use of time series analysis to study performance of an individual. A paper by A. C. Bittner, Jr. and D. C. Chatfield shows how signal detection theory can be applied to performance testing.
Author (GRA)

N82-25885# Naval Research Lab., Washington, D. C.
RELAXATION PROCESSES AND TIME SCALE TRANSFORMATION Interim Report, Jun. - Nov. 1981
S. Teitler, A. K. Rajagopal, and K. L. Ngai 1 Mar. 1982 17 p refs
(RR0110242)
(AD-A111268; NRL-MR-4757) Avail: NTIS HC A02/MF A01 CSCL 12/1

Stochastic processes with a special class of non-stationary transition rates (NSTR) that can be related to stationary rates (STR) by time scale transformations are considered. Calculations are carried out on the time scale on which the process has STR and then related to the time scale of measurements by a time scale transformation. Application is made to Gaussian Markoff processes with a single transition rate. The resulting equilibrium autocorrelation function departs from weak stationarity. A response function is related to the Autocorrelation function and specialized to relaxation processes to yield a model consistent with Ngai's recent model of relaxation. The model is therefore widely applicable in the description of measured relaxation behavior and leads naturally to Ngai's renormalization relation for excitation energies. On the basis of the success of the model, consideration is given to the possibility that the process should be viewed as one with STR and an intrinsic time scale so that the process only appears to have NSTR on the time scale of measurements.
Author (GRA)

N82-25886# Reliability Analysis Center, Griffiss AFB, N. Y.
CORRELATION OF FIELD DATA WITH RELIABILITY PREDICTIONS MODELS Final Technical Report, Aug. 1979 - Sep. 1981
K. A. Dey Griffiss AFB, N.Y. RADC Nov. 1981 150 p refs
(Contract F30602-78-C-0281; AF Proj. 2338)
(AD-A111258; RADC-TR-81-329) Avail: NTIS HC A07/MF A01 CSCL 12/1

This report considers the factors influencing the goodness of fit of MIL-HDBK-217C prediction models. Although it is not possible to statistically separate casual factors in every case, areas in which the models are deficient are identified and quantified. Possible causes are reviewed and the most likely casual factors identified. Where positive interferences are possible, a range of statistical methods are used to give an unbiased assessment. The underlying distribution of time to failure

is investigated since MIL-HDBK-217C assumes a constant failure rate model. Results suggest that no great error will accrue from such an assumption although strictly it is not always valid. The statistical models developed for this study may be used for future model evaluation whenever an unbiased assessment is required. The correlation matrix/ratio plot method may be used iteratively to construct an optimal model but least squares regression analysis is preferred. The ratio plot method allows empirical confidence intervals on predicted failure rates to be readily evaluated. Author (GRA)

N82-25887# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Statistics.
THE CONTRIBUTIONS OF WILLIAM COCHRAN TO CATEGORICAL DATA ANALYSIS
Stephen E. Fienberg Dec. 1981 24 p refs
(Contract N00014-80-C-0637)
(AD-A111014; TR-222) Avail: NTIS HC A02/MF A01 CSCL 12/1

The paper reviews the contributions of Wm. Cochran to the analysis of categorical data, focussing on: (a) the distribution of chi-square test statistics in the presence of small expectations, and the correction for continuity; (b) the Q-test for comparing percentages in matched samples; (c) methods for strengthening chi-square-tests; (d) the Cochran test for combining results from several 2x2 tables. Some links are made between Cochran's work and recent literature on the analysis of categorical data using loglinear models. Author (GRA)

N82-25888# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Statistics.
RECENT ADVANCES IN THEORY AND METHODS FOR THE ANALYSIS OF CATEGORICAL DATA: MAKING THE LINK TO STATISTICAL PRACTICE
Stephen E. Fienberg Dec. 1981 33 p refs Presented at the 43rd Intern. Statist. Inst., Buenos Aires, 30 Nov. - 11 Dec. 1981
(Contract N00014-80-C-0637)
(AD-A111016; TR-229) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper reviews some of the general results on maximum likelihood estimation for loglinear models. These results have special relevance for the analysis of multidimensional contingency tables, and for the reporting of data from large-scale sample surveys. In addition, the results are applicable to other categorical data problems that are often representable in contingency table form. GRA

N82-25889# California Univ., Berkeley. Operations Research Center.
A BAYESIAN INTERPRETATION OF DATA TRIMMING TO REMOVE EXCESS CLAIMS. EXCESS CLAIMS AND DATA TRIMMING IN THE CONTEXT OF CREDIBILITY RATING PROCEDURES
William S. Jewell, Hans Buehlmann, and Alois Gisler Dec. 1981 41 p refs
(Grant AF-AFOSR-0122-81; AF Proj. 2304)
(AD-A111690; ORC-81-24) Avail: NTIS HC A03/MF A01 CSCL 12/1

The effect of excess or catastrophic claims is well recognized in insurance. For example, in experience rating it is customary to truncate the data to minimize the effect of such outliers; Gisler has recently proposed a credibility formula using such data trimming. This paper develops a model of the excess claims process and finds the exact Bayesian forecast. The resulting forecast form is approximately at data trim, thus justifying the simpler, heuristic approach. Author (GRA)

N82-25890# California Univ., Berkeley. Operations Research Center.
ASSESSMENT OF SUBJECTIVE PROBABILITY
Richard E. Barlow Dec. 1981 8 p refs Presented at the DOE Statist. Symp., Long Island, N.Y., 4 Nov. 1981
(Grant AF-AFOSR-0122-81; AF Proj. 2304)
(AD-A111691; ORC-81-23) Avail: NTIS HC A02/MF A01 CSCL 12/1

The assessment of subjective probability is of great interest in risk analysis. Some aids for assessing subjective probability are surveyed. The connection with statistical inference and recent papers on statistical foundations are discussed. GRA

N82-25891# Pittsburg Univ., Pa. Inst. for Statistics and Applications.
ASYMPTOTIC DISTRIBUTION OF THE LIKELIHOOD RATIO TEST STATISTIC FOR SPHERICITY OF COMPLEX MULTIVARIATE NORMAL DISTRIBUTION
C. Fang, P. R. Krishnaiah, and B. N. Nagarsenker Aug. 1981 34 p refs
(Contract F49620-79-C-0161; AF Proj. 2304)
(AD-A111112; TR-81-27; AFOSR-82-0036TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The authors approximated the distribution of certain power of the likelihood ratio test statistic for sphericity of the complex multivariate normal distribution with a beta type series in the null and nonnull cases. Applications of these results to multiple time series are also discussed. GRA

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N82-25892*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MANAGEMENT AND CONTROL OF SELF-REPLICATING SYSTEMS: A SYSTEMS MODEL
Georg vonTiesenhausen Feb. 1982 36 p refs
(NASA-TM-82460; NAS 1.15:82460) Avail: NTIS HC A03/MF A01 CSCL 12B

In 1980, a conceptual engineering approach to self-replicating systems was achieved. The design was based on von Newmann's kinematic version of self-replicating automata. The systems management and control and the organization of the control elements are reported. After developing the functional requirements of such a system, a hierarchy of three management and control levels is described. These are an autonomous, an external, and an intelligent management and control system. Systems recycling, systems specialization, and information replication are discussed. Author

N82-25893# State Univ. of New York at Buffalo, Amherst. Group of Computer Studies of Strategies.
TOWARD A THEORY OF STRATEGIES
Nicholas V. Findler Dec. 1981 29 p refs
(Grant AF-AFOSR-0220-81; AF Proj. 2307)
(AD-A111008; GCSS-TR-6; GCSS-TR-194; AFOSR-82-0048TR) Avail: NTIS HC A03/MF A01 CSCL 12/2

Some of the objectives and working tools of a new area of study, tentatively called Theory of Strategies, are described. It is based on the methodology of artificial intelligence, decision theory, utility theory, operations research and digital gaming. The latter refers to computing activity that incorporates model building, simulation and learning games in conflict situations. Three long-term projects which aim at automatically analyzing and synthesizing strategies are also described. Author (GRA)

N82-25894# Alabama Univ. in Huntsville. School of Science and Engineering.
WEAPONS SYSTEMS ANALYSIS Final Report, 2 Jun. - 30 Sep. 1981
Y. S. Sherif and N. A. Kheir Oct. 1981 99 p refs
(Contract DAAH01-81-D-A006)
(AD-A111637; AD-E950197; DRSMI/RD-CR-82-2) Avail: NTIS HC A05/MF A01 CSCL 15/3

Often, a weapon system may be approved based on a particular required military capability without due consideration given to other missions which it might or might not be able to perform. This report puts forward a methodology for the analysis of weapon systems, and examines various criteria and attributes that relate to system effectiveness. Criteria and attributes included are system performance, operational readiness, life cycle costing, design to cost, reliability, availability maintainability, producibility, operability, capability, adequacy, logistics, etc. A

spectrum of simulation techniques and languages applicable to weapons systems analysis in general and air defense weaponry in particular is identified, defined classified and evaluated with respect to practicality, efficiency and credibility. The report also addresses and evaluates various air defense strategies, techniques and tactics. Author (GRA)

N82-25895# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.
THE PERFECTLY MATCHABLE SUBGRAPH POLYTYPE OF A BIPARTITE GRAPH
Egon Balas and William Pulleyblank (Waterloo Univ.) Jan. 1982 36 p refs
(Contract N00014-75-C-0621; Grant NSF ECS-79-02506; NR Proj. 047-048)
(AD-A111439; MSRR-480; WP-21-81-82) Avail: NTIS HC A03/MF A01 CSCL 12/2

The following type of problem arises in practice: in a node-weighted graph G, find a minimum weight node set that satisfies certain conditions and, in addition, induces a perfectly matchable subgraph of G. This has led us to study the convex hull of incidence vectors of node sets that induce perfectly matchable subgraphs of a graph G, which we call the perfectly matchable subgraph polytype of G. For the case when G is bipartite, we give a linear characterization of this polytype, i.e., specify a system of linear inequalities whose basic solutions are the incidence vectors of perfectly matchable node sets of G. We derive this result by three different approaches, using linear programming duality, projection, and lattice polyhedra, respectively. The projection approach is used here for the first time as a proof method in polyhedral combinatorics, and seems to have many similar applications. Finally, we completely characterize the facets of our polytype, i.e., separate the essential inequalities of our linear defining system from the redundant ones.
Author (GRA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N82-25896# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
ON HILBERT SPACE OF PATHS
P. Exner and G. I. Kolerov 1980 7 p refs Submitted for publication
(JINR-E-2-80-257) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A Hilbert space of paths, the elements of which are determined by trigonometric series, was proposed and used recently by Truman. This space is shown to consist precisely of all absolutely continuous paths ending in the origin with square integrable derivatives. DOE

N82-25897# Nordisk Institut for Teoretisk Atomfysik, Copenhagen (Denmark).
SPECTRAL DENSITY FOR TWO DIMENSIONAL CONTINUUM QCD
B. Durhuus and P. Olesen Dec. 1980 27 p refs Prepared in cooperation with Niels Bohr Inst., Copenhagen
(NBI-HE-80-56) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

A nonlinear differential equation for the spectral density rho of the eigenvalues of the Wilson operator is shown for continuum QCD(2). The general solution leads to a transcendental equation for rho, and the properties of this equation are analyzed. The properties of rho strikingly resemble those of the corresponding lattice spectral density, although there is no phase transition in the continuum case. DOE

N82-25898# Paris XI Univ., Orsay (France). Inst. de Physique Nucleaire.
REMARKS ABOUT LIPPMANN-SCHWINGER EQUATIONS IN THE MANY BODY SCATTERING THEORY
P. Benoist-Gueutal Mar. 1981 44 p refs In FRENCH; ENGLISH summary
(DE81-700602; IPNO-TH-81-16) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

Lippmann-Schwinger integral equation is a formulation of many body scattering theory. Its solution is unique. However this equation is sometimes written in a modified form, the limiting process epsilon (FEMALE)O(-) being performed before solving the equation. We show that in this modified form the equation has no solution except for a two body equivalent problem. DOE

N82-25899# Institut Fiziki Vysokikh Energii, Serpukhov (USSR).
SUPERALGEBRA b(0.1) AND EXPLICIT INTEGRATION OF THE SUPERSYMMETRIC LIOUVILLE EQUATION
A. N. Leznov, M. Y. Saveliev, and D. A. Leites (Steklov Mathematical Inst.) 1980 7 p refs
(IFVE-OTF-80-79) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The supersymmetric Liouville equation which is integrated explicitly to trace the differences arising in integration of supersymmetric equations is described. The general solutions are defined by four arbitrary functions. The gauge field potential entering the representation of zero curvature are spanned by the elements of Lie superalgebra b(0.1) (oSp(2.1). DOE

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N82-25900# SRI International Corp., Menlo Park, Calif.
NOVEL EDDY-CURRENT PROBE DEVELOPMENT Final Report, 15 Jul. 1980 - 15 Aug. 1981
Alfred J. Bahr and J. P. Watjen Wright-Patterson AFB, Ohio AFWAL Dec. 1981 95 p refs
(Contract F33615-80-C-5025; SRI Proj. 1908)
(AD-A112042; AFWAL-TR-81-4159) Avail: NTIS HC A05/MF A01 CSCL 20/3

This report describes the development of two novel eddy-current probes that are fabricated using printed-circuit techniques. The objective of this work was to develop reproducible, sensitive probes. One of the probes developed is a quarter-wave microstrip resonator that operates at 1 GHz, while the other probe used a broadband printed-circuit coil that can be operated in a frequency range of 10 to 400 MHz. The microwave probe was found to be very sensitive to open flaws, and seems well suited for detecting such flaws in parts that can be mechanically scanned past a fixed probe. The sensitivity of the printed-coil probe to open flaws was less than that of the microwave probe, but it was usually better than that exhibited by conventional coil probes. Also, it is easy to fabricate, is reproducible, and is moderately maneuverable. This report also presents data obtained using a modified floppy-disk head as an eddy-current probe at 100 kHz. This probe showed a high sensitivity to both open and closed flaws and is recommended for further evaluation and development. GRA

N82-25901# Brown Univ., Providence, R. I. Dept. of Chemistry.
STRUCTURAL AND ELECTRONIC RELATIONSHIPS BETWEEN CONDUCTING IRON NIOBATES AND IRON TUNGSTATES
H. Leiva, K. Seiber, B. Khazai, K. Dwight, and A. Wold 24 Feb. 1982 25 p refs
(Contract N00014-77-C-0387)
(AD-A111881; TR-17) Avail: NTIS HC A02/MF A01 CSCL 20/3

Members of the system Fe-Nb-O and Fe-W-O have been compared, and their electronic properties have been correlated with the structural parameters. The compounds crystallize as ordered variants of the basic alpha-PbO2 structure, and the nature of the ordering of the FeO6 and NbO6 or WO6 octahedra determines the conductivity which may be observed for these phases. Author (GRA)

N82-25902# Naval Ship Research and Development Center, Bethesda, Md. Propulsion and Auxiliary Systems Dept.
MAGNETIC INDUCTION OF SPHERICAL AND PROLATE SPHEROIDAL BODIES WITH INFINITESIMALLY THIN

CURRENT BANDS HAVING A COMMON AXIS OF SYMMETRY AND IN UNIFORM INDUCING FIELD, A SUMMARY Final Report

F. Edward Baker, Jr. and Samuel H. Brown Jan. 1982 205 p refs

(B0005SL001)

(AD-A111194; DTNSRDC-81/014) Avail: NTIS HC A10/MF A01 CSCL 20/3

Magnetic induction is calculated for several configurations of ferromagnetic spherical and prolate spheroidal bodies (hollow and solid) with internal and/or external infinitesimally thin spherical and spheroidal current bands, respectively. Magnetic induction is presented for ferromagnetic spherical and spheroidal bodies in a constant inducing field of arbitrary orientation. The ferromagnetic bodies are assumed to be linear and homogeneous. The reduction of the current band problem solutions to that of a current band in vacuum is shown when the permeability of the ferromagnetic body is allowed to approach that of vacuum. The application of the super-position principle to obtain a total magnetic field solution for the case of a ferromagnetic body (hollow or solid) surrounding and/or surrounded by a current band and immersed in a uniform inducing field of arbitrary direction, is discussed. Author (GRA)

N82-25903# Hebrew Univ., Jerusalem (Israel). Dept. of Atmospheric Sciences.

THE DYNAMICS OF NONSPHERICAL AEROSOL PARTICLES. 5: THE WALL EFFECT IN ORDERLY DEPOSITION; BROWNIAN DIFFUSION Final Technical Report, Mar. 1978 - Oct. 1981

Isaiah Gallily Dec. 1981 74 p refs

(Grant DA-ERO-78-G-057; DA Proj. 1T1-61102-BH-57)

(AD-A111030) Avail: NTIS HC A04/MF A01 CSCL 20/8

The effect of the wall on the motion of elongated aerosol particles was calculated on the basis of the (powerful) slender body theory for a quiet and flowing medium. The cases treated were those of cylindrical particles moving in a quiet environment or a Couette or a Poiseuille flow near plannar surfaces with various inclinations to the horizontal. Experiments of trajectory photographing were performed in a liquid-tank under creeping flow conditions and typical (aerosol) Reynolds numbers whereby very good correspondence with computations was obtained. The Brownian diffusion of (very small) cylindrical or discoidal aerosol particles was also studied while being based on Brenners' formal structure. To evaluate the significant orientation density function, the (mid-diameter) rotational diffusion coefficient of the particles was calculated by a statistical-mechanical method. The values of the coefficients were found to be larger than those computed on the basis of continuum theory by a factor of about 30. The typical diffusion situation of deposition on a plane within a quiet air was treated. Author (GRA)

N82-25904# Cornell Univ., Ithaca, N. Y. Dept. of Structural Engineering.

EDDY CURRENT CALCULATIONS IN THIN CONDUCTING PLATES USING A FINITE ELEMENT-STREAM FUNCTION CODE. A BOUNDARY INTEGRAL METHOD FOR EDDY CURRENT FLOW AROUND CRACKS IN THIN PLATES

K. Y. Yuan, J. F. Abel, F. C. Moon, M. A. Morjaria, and S. Muhkerjee Sep. 1981 18 p refs Presented at COMPUMAG-3, the 3rd Intern. Conf. on the Computation of Magnetic Fields, Chicago, Sep. 1981 Submitted for publication

(Contract N00014-79-C-0224)

(AD-A111013) Avail: NTIS HC A02/MF A01 CSCL 20/3

A stream function or vector potential for the current density vector is used to develop a finite element code for calculating induced currents in thin conducting plates. While two dimensional, the code includes self field effects for harmonic fields for skin depths on the order of the plate thickness and larger. The solution of the resulting integro-differential equation, using a Galerkin method, leads to a complex, nonsymmetric, fully populated global matrix. In addition to the current density, the code also calculates induced temperatures due to Joule heating and the magnetic forces on the plate. The results are compared to infrared measurements of induced currents in rectangular plates. Extension of the code to transient problems using both fast Fourier transform and direct integration methods is in progress. A boundary element method which employs a Green's function for a crack has been developed to calculate the induced eddy current flow around cracks in thin conducting plates. The theoretical equations employ a stream function for the current density vector and is equivalent to the electric field vector potential methods. GRA

N82-25905# Cornell Univ., Ithaca, N. Y. Dept. of Structural Engineering.

THE VIRIAL THEOREM AND SCALING LAWS FOR SUPERCONDUCTING MAGNET SYSTEMS Report, Feb. - May 1981

Francis C. Moon 31 May 1981 33 p refs

(Contract N00014-79-C-0224; Grant NSF ENG-76-23627; NR Proj. 064-621)

(AD-A111011; TR-5) Avail: NTIS HC A03/MF A01 CSCL 20/3

The structural masses of over thirty superconducting magnet designs are shown to exceed that required by the virial theorem by factors of from two to ten or more. Designs for MHD and toroidal field (TF) fusion magnets from many different magnet groups around the world obey a stored energy-mass scaling law of the form E = CM4/3. This scaling law appears to be valid over three to four orders of magnitude of stored magnetic energy. The 4/3 power law differs from the linear scaling derived from the virial theorem and appears to result from the thermal stability requirements of the super-conductor. However, the masses of large scale TF magnets are approaching the regime where the structural mass required by the virial theorem will place greater constraints on the design than the thermal stability. Author (GRA)

N82-25906# Niels Bohr Inst., Copenhagen (Denmark).

STRUCTURE OF THE QCD VACUUM IN THE LARGE N LIMIT

H. Flyvbjerg and J. L. Petersen Dec. 1980 20 p refs

(NBI-HE-80-57) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

An approximate QCD vacuum for SU (N(FEMALE) infinity) is presented. It is a generalization of the ferromagnetic vacuum first obtained by Savvidy for SU(2) and generalized to SU(3) and SU(4). Problems occurring for N > or = 5 are handled in the large N limit by a continuous formalism, and the vacuum obtained is characterized by N-1 constant, commuting, colormagnetic fields with an isotropic distribution of spatial directions. The energy density of this vacuum is lower than that of the perturbative vacuum by a number proportional to N(2), as expected from general large N arguments. Like the Savvidy vacuum the large N vacuum may decay into a variant of the domained Copenhagen vacuum. A lower limit on the domain size is given. DOE

N82-25907# Niels Bohr Inst., Copenhagen (Denmark).

MAKEENKO-MIGDAL EQUATION IN A DOMAINED QCD VACUUM

P. Olesen and J. I. Petersen Oct. 1980 24 p refs

(NBI-HE-80-42) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A solution for simple curves of the Makeenko-Migdal equation is presented which leads to string dynamics. By the nonrenormalized nature of the equation, any formal solution requires some extra physics input before it can be meaningfully interpreted. Then a 'minimal' renormalization is proposed both of the Wilson loop for a large number of colors and of the corresponding Makeenko-Migdal equation. This scheme is based on Witten's idea of a master field. The regularized solution contains a scale (related to the Regge-slope) which is connected to a gauge invariant domain size in the QCD vacuum, and the solution can only make sense for loops that are large relative to this scale. Using a vortex condensate model for the QCD vacuum, the length parameter is related to the QCD length scale. DOE

N82-25908# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Moscow (USSR). Inst. of Theoretical and Experimental Physics.

WILSON LOOP IN VACUUM FIELDS

M. A. Shifman 1980 29 p refs

(ITEP-12(1980)) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The behavior of the Wilson loop average W(C) is considered

in nonperturbative QCD. The idea is to start from small contours and then proceed to larger ones treating the effects of vacuum fields phenomenologically, through matrix elements like less than g sup (2) G sub ((SIGMA) (MU)) sup (a) G sub ((SIGMA) (MU)) sup (a) greater than. An expansion is derived which gives W(C) as an infinite series of local gluonic operators. A few terms of this series are calculated exactly revealing a highly non-trivial dependence on the contour variables. Under a certain approximation an infinite set of leading terms is isolated and summed up. The result depends on the area of the contour, but this dependence is not quite satisfactory. As a byproduct of the analysis it is shown that in the framework of multicolor chromodynamics the bag picture of Callan, et. al., can not be realized. DOE

N82-25909# Institut Fiziki Vysokikh Energii, Serpukhov (USSR).
DO EXTENDED BODIES MOVE ALONG THE GEODESICS OF THE RIEMANNIAN SPACE TIME
V. I. Denisov, A. A. Logunov, and M. A. Mestvirishvili 1980 66 p refs Submitted for publication
(IFVE-OTF-80-128) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

Motion of a massive self gravitating body in the gravitational field of a distant massive source was considered in the post Newtonian approximation of the arbitrary metric gravitational theory. The comparison of the massive body center of mass acceleration with that of a point one, moving in Riemannian space time, whose metrics formally is equivalent to the metrics of two moving massive bodies, makes it clear that in any metric gravitation theory, possessing energy momentum conservation laws for matter and gravitational field, taken together, massive body does not move, generally speaking, along the geodesics of Riemannian space time. Application of the obtained general formulae to the system Earth-Sun and using the experimental results from lunar laser ranging has shown that the Earth during its motion along the orbit, oscillates with respect to the reference geodesic of the geometry with the period of 1 hour and the amplitude not less than 10(+2) cm, which is a post Newtonian quantity. DOE

N82-25910# Science Research Council, Chilton (England).
COMPUMAG: PAPERS PRESENTED BY MEMBERS OF THE LABORATORY AT THE CONFERENCE OF THE COMPUTATION OF ELECTROMAGNETIC FIELD
A. G. A. M. Armstrong 1981 39 p refs Conf. held at Chicago, 14-17 Sep. 1981
(PB82-134164; RL-81-076) Copyright. Avail: NTIS HC A03/MF A01 CSCL 20C

Papers on the PE2D package for transient eddy current anaysis, automated optimization of magnet design using the boundary integral method, three dimensional eddy current computations, a space charge beam option for the PE2D and TOSCA packages, two dimensional automatic triangular mesh generation for the finite element electromagnetics package PE2D and a comparison of integral and differential equation solutions filed problems are presented. GRA

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N82-25911# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Reaktorbauelemente.
EXPERIMENTAL AND THEORETICAL INVESTIGATIONS ON THE TRANSMISSION OF SOUND THROUGH SINGLE AND DOUBLE PLATES IN AIR AND HELIUM AT PRESSURES UP TO 50 BARS Ph.D. Thesis
M. Kehr Jul. 1980 128 p refs In GERMAN; ENGLISH summary
(JUEL-1667; ISSN-0366-0885) Avail: NTIS (US Sales Only) HC A07/MF A01; DOE Depository Libraries

The thermal insulation in hot gas ducts of high temperature reactors (HTR) is subjected to dynamic loads due to pressure fluctuations. These fluctuations which are caused by turbomachines or by turbulent pipe flow may cause mechanical failures. To find out the transmission of sound energy through the structure of the insulation it is necessary to make investigations at pressures up to 50 bars with He. The radiation of sound by blowers and the propagaton of sound in circular tubes is considered. The transmission of sound through a single and a double plate is calculated based on computations by the methods of room acoustics and statistical energy analysis (SEA) derived for conditions at ambient pressure. The transmission of sound through single and double plates was investigated in a tube at pressures up to 50 bars with air and He. The results of these experiments were compared with the theoretical predictions. Especially at higher frequencies the agreement between theory and experimental results are good. The main parameter influencing sound transmission is the wave resistance. DOE

N82-25912# Statens Provningsanstalt, Boraas (Sweden). Acoustics Lab.
DETERMINATION OF SOUND POWER LEVELS OF EXTERNAL NOISE SOURCES. PART 1: MEASUREMENT METHODS. PART 2: SOME MEASUREMENTS Final Report
Hans G. Jonasson and Lennart Eslon 1981 76 p refs
(Contract SWED-EPB-7-761/79A)
(SP-RAPP-1981:45) Avail: NTIS HC A05/MF A01

A general frame standard for determining sound power levels of external noise sources by in situ measurements is proposed. Suitable ISO standards, a long distance method which permits directivity measurement and a short distance method are incorporated. Measurements can be made in front of walls and in corners. The short distance method uses a parallelepipedical measurement surface, omitting the top microphone position. Recommended measurement distance is < or = 5 m. The microphone height h = (height of reference box) + d may be exchanged for height <10 m, giving highest sound pressure level whenever h < 10 m. For very large sources, near field corrections are introduced to cancel the effect to sound energy not passing at right angles to the measurement surface. The long distance method uses a 1/2, 1/4 or 1/8 spherical measurement surface. When directivity measurements are made, the number of microphone positions are doubled relative to those of ISO 3746. The directivity index is then calculated as in ISO 3744. Measurements confirm the validity of the methods.
Author (ESA)

N82-25913# Southampton Univ. (England). Inst. of Sound and Vibration Research.
ACOUSTIC MODEL POWER DISTRIBUTION IN A DUCT AT HIGH FREQUENCIES
Stephen M. Baxter Apr. 1981 42 p refs
(PB82-139064; ISVR-TR-111) Avail: NTIS HC A03/MF A01 CSCL 14/2

A project undertaken with the National Gas Turbine Establishment (N.G.T.E.) is described. The project is an experimental and theoretical investigation of the distribution of acoustic power among the modes of an acoustic duct. The duct forms part of an absorber test facility. The experiment is intended to test an assumption currently used in interpreting data from the facility, namely that the sound power in the duct is equally distributed among the propagating acoustic modes. The report is essentially a progress report, and covers the theoretical basis for the measurement technique. At the time of writing the experiment and its analysis are not complete. A brief description of the experiment and its motivation are provided. A presentation of the theory is also given. GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N82-25914*# Northwestern Univ., Evanston, Ill. Dept. of Materials Science.
CHEMISORPTION AND REACTIONS ON CLUSTERS OF NICKEL ATOMS
J. T. Waber, H. Adachi (Osaka Univ.), and T. Yu [1982] 22 p refs

(Grant NGR-14-007-131)
(NASA-CR-169006; NAS 1.26:169006) Avail: NTIS HC A02/MF A01 CSCL 20H

The nucleation and growth of metallic clusters on a substantially amorphous substrate are discussed with emphasis on the geometrical and electronic structure of the clusters. Several clusters of different symmetry containing five to nine nickel atoms were studied. It was found that the energy range of primary d-like states is not significantly different from the width of the d-band states in nickel metal, as long as the interatomic distance is comparable to that in the bulk metal. The approach of one or more molecules to the cluster is examined using at the hydrogenation of acetylene and the dehydrogenation of ethylene as examples. A.R.H.

N82-25915# Pennsylvania Univ., Philadelphia.
INTERPRETATION OF SATELLITE STRUCTURE IN THE X-RAY PHOTOELECTRON SPECTRA OF CO ADSORBED ON Cu(100) Interim Report
R. P. Messmer (GE, Schenectady, N.Y.), S. H. Lamson, and D. R. Salahub (Montreal Univ.) 10 Feb. 1982 44 p refs Submitted for publication Sponsored in part by NSERC and GE
(Contract N00014-79-C-0991)
(AD-A111402; TR-9) Avail: NTIS HC A03/MF A01 CSCL 20/8

By employing the X alpha-scattering wave method with a Cu9CO cluster to model the chemisorption of CO on a one-fold site of a Cu(100) surface, a simple interpretation of the satellite structure observed in the X-ray photoelectron spectrum (XPS) in the C1s and O1s regions, has been obtained. The physical model obtained by analyzing the results of the Cu9CO cluster calculations is qualitatively the same as that obtained in a previous study of a Cu5CO cluster with the CO in a four-fold site (Solid State Comm. 36, 265 (1980)). The quantitative differences suggest that the present Cu9CO cluster is the better model, however. Experimentally, a three peak structure is observed in both the O1s and C1s hole spectra. The 'first' peak, at lowest binding energy, is followed by a second peak at 2-3 eV higher binding energy and the third peak is at 7-8 eV higher binding energy with respect to the first peak. GRA

N82-25916# Naval Research Lab., Washington, D. C.
REPETITIVE OPERATION OF AN INDUCTIVELY DRIVEN ELECTRON-BEAM DIODE Interim Report
B. Fell (Jaycor, Inc.), R. J. Commisso (Jaycor, Inc.), V. E. Scherrer, and I. M. Vitkovitsky 11 Jan. 1982 28 p refs
(RR0110941)
(AD-A110565; NRL-MR-4714) Avail: NTIS HC A03/MF A01 CSCL 20/7

Recovery of pulsed electron beam diodes operating in the 50 A/sq cm range has been studied using an inductive storage source producing two 100-200 kV pulses with separation ranging from about 10-500 microsec. The diode cannot instantaneously support a second voltage pulse because of the effective short circuit provided by the interelectrode plasma associated with the first pulse. After a period of about 100 microsec, the voltage applied to the diode is not short-circuited and a second electron beam, nearly identical to the first, is formed. GRA

N82-25917# Naval Research Lab., Washington, D. C.
PRODUCTION OF INTENSE LIGHT ION BEAM FROM A SUPERPOWER GENERATOR Interim Report
F. C. Young, G. Cooperstein, S. A. Goldstein, D. Mosher, S. J. Stephanakis, W. F. Oliphant, J. R. Boller, J. Maenchen, R. D. Genuario, and R. N. Stringfield 15 Jan. 1982 57 p refs
(DNA Proj. T99-QAXL)
(AD-A110487; NRL-MR-4726) Avail: NTIS HC A04/MF A01 CSCL 20/7

The operation of a pinch-reflex diode as an intense pulsed ion-beam source has been scaled up to the multiterawatt PITHON generator. Ion beams with currents of 1 MA at 1.8 MeV have been extracted in a 130 kJ, 100-ns (FWHM) pulse. The corresponding ion production efficiency is 60%. Power losses were observed in interfacing the coaxial diode to the biconic vacuum feed of the generator. By using smaller area diodes, the average current density at the anode source has been increased to 20 kA/sq cm. Proton and deuteron beams were studied in both planar and spherical diode geometries. The focusing of ion beams is predominately by self-magnetic fields for planar diodes and predominately by electrode shaping for spherical diodes. Curent densities of at least 150 kA/sq cm were achieved with spherical didoes. The spatial evolution of the anode and cathode plasmas was studied by laser interferometric holography. As the peak of the power pulse is approached, plasmas were observed to expand from the electrodes in fairly uniform profiles with steep density gradients and to accelerate across the vacuum gap. After peak power, anode plasma fluctuations and a high velocity (30 cm/microsec) axial plume develop; the latter expands radially coincident with collapse of the power pulse. Author (GRA)

N82-25918# Naval Research Lab., Washington, D. C.
ELECTRON EXCITATION AND IONIZATION RATE COEFFICIENTS FOR N2, O2, NO, N AND O Interim Report
S. Slinker and A. W. Ali 25 Feb. 1982 44 p refs
(WF34388501)
(AD-A110988; NRL-MR-4756) Avail: NTIS HC A03/MF A01 CSCL 20/7

Excitation and ionization rate coefficients for N2, O2, NO, N and O are calculated using measured and calculated cross sections. Momentum transfer rate coefficients in N2, O2 and O are also calculated. Author (GRA)

N82-25919# Naval Research Lab., Washington, D. C. Radiation-Matter Interaction Branch.
HEAVY ION FRAGMENTATION AT INTERMEDIATE ENERGY Interim Report
J. Kidd, N. Seeman, and G. Woods 1 Mar. 1982 26 p refs
(RR0120241)
(AD-A111451; NRL-MR-4733) Avail: NTIS HC A03/MF A01 CSCL 20/7

The N.R.L. Heavy Ion Experiment, which was run at the Lawrence Berkeley Laboratory Bevatron Accelerator, measured the single-particle inclusive productions cross sections and momentum distributions for carbon ions at 250 Me V/u incident on CU, C, CH2 (and hydrogen) targets. The discussion of this experiment will include: (1) the detector design, (2) the beam monitoring system and fast logic, (3) the running system software, and (4) the analysis and preliminary results. The mass resolution achieved was Delta approx 0.15 and the spatial resolution with the drift chamber was approx 0.5 mm. A separate report will discuss the final results and their implications. GRA

N82-25920# California Univ., Riverside. Dept. of Physics.
CALCULATION OF ELECTRON-HYDROGEN, DEUTERIUM AND OXYGEN MOLECULES Final Report, Apr. 1979 - Apr. 1980
R. T. Poe and B. H. Choi Wright-Patterson AFB, Ohio AFWAL Jun. 1981 74 p refs
(Contract F33615-77-C-2011; AF Proj. 2301)
(AD-A110689; AFWAL-TR-81-2051) Avail: NTIS HC A04/MF A01 CSCL 20/8

Calculations are made on the vibrational transition cross sections of e-H2, D2 scatterings in the energy range of 0 appox. 10eV. Both hybrid theory and the simultaneous vibrational and rotational adiabatic-nuclei approximation are employed in the calculation. It turns out that the latter approximation scheme yields better results than the hybrid theory approach when compared with experimental measurements on 0 yields v vibrational excitation. The resonance peaks of the elastic scattering and vibrational excitation cross section obtained from the vibrational and rotational adiabatic-nuclei approximation are quite broad between 2 approx. 3 eV, which are in good agreements with experimental data. This seems to indicate that the periods of the vibrational and rotational motions are comparable to each other and longer than the lifetime of the compound molecule. In general, the rate of the vibrational transition decreases as the quantum number change increases. The e-02 vibrational transition cross sections have also been explored with a semi-quantitative analysis. GRA

N82-25921# JAYCOR, Alexandria, Va.
ION DIODE RESEARCH ON THE AURORA ACCELERATOR Final Report, 5 Jan. 1981 - 5 Jan. 1982
Robert A. Meger 27 Jan. 1982 175 p refs

(Contract N00014-81-C-2093)
(AD-A111663; JAYCOR-J207-82-001FR) Avail: NTIS HC A08/MF A01 CSCL 20/7

Within the last few years interest in ion beams for inertial confinement fusion (ICF) applications has increased significantly. The Naval Research Laboratory (NRL), with support from JAYCOR, has been in the forefront of that research effort. The ion source which NRL has concentrated on is known as the pinch reflex diode (PRD). This type of ion diode was originated at NRL with JAYCOR assistance and is presently one of the few designs with application to ICF. The PRD, is comprised of a hollow cylindrical cathode of radius R separated from a plasma anode by a diode gap D. When a voltage is placed across the gap, electrons emitted from the cathode are accelerated toward the anode while being pinched toward the axis by their own magnetic field. The anode is normally made of a disk of thin dielectric material connected to a conducting backplate by a small conducting cylinder on axis. Electrons hitting the anode pass through and are reflexed back into the diode gap by the magnetic field from the current driven in the central button. Electrons undergo the combined reflexing and pinching motion until they are collected by the central button. Ions from the plasma formed on the front surface of the dielectric anode due to electron heating or flashover mechanisms are accelerated across the diode gap toward the cathode. The relative ion and electron current densities depend on the difference in crossing times of the two charge species. For diode voltages in the 1-10 MV range the ions move in nearly straight line trajectories at nonrelativistic velocities while the electrons are quickly accelerated to near the speed of light. GRA

N82-25922# Argonne National Lab., Ill. Radiological and Environmental Research Div.

HIGH-RESOLUTION SPECTROSCOPY AND DYNAMICS OF MULTIPHOTON PROCESSES IN ATOMS AND MOLECULES

Annual Summary Report, 1 Jun. 1981 - 31 May 1982

Patricia M. Dehmer and Joseph L. Dehmer 17 Feb. 1982 6 p ref

(Contract N00014-81-F-0051; NR Proj. 394-051)
(AD-A111462) Avail: NTIS HC A02/MF A01 CSCL 07/4

This report summarizes research to establish the high-resolution spectroscopy and detailed mechanisms of sequences of resonant transitions induced in atoms and molecules by multicolor, multiphoton excitation. These processes are studied as a function of the independently tunable frequencies and polarization states of multiple dye laser beams in order to establish both the underlying physics and the high degree of selectivity of this advanced form of laser excitation. Detection methods include photoelectron analysis, mass spectrometry, and laser-induced fluorescence. The initial phase of work covered in this report included design, construction, and testing of all major components of the experimental apparatus needed to perform these studies. In addition, measurements of photoelectrons ejected from rare gas atoms by nonresonant, multiphoton excitation are described. Author (GRA)

N82-25923# Copenhagen Univ. (Denmark).

EXPERIMENTAL AND SIMULATED BEAM-FOIL DECAY CURVES FOR SOME TRANSITIONS IN Zn2

S. Hultberg, L. Liljeby, S. Mannervik, E. Veje, and A. Lindgaard 1980 45 p refs

(KU-HCOE-FL2-R-80-15) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

Experimental beam foil decay curves for the 4s-4p, 4p-4d, 4d-4f, and the 4p-5s transitions in Zn II are compared to decay curves synthesized from transition probabilities calculated in the numerical coulomb approximation and either measured initial level populations or population models. Good agreement exists between experimental curves and those based on the measured initial level populations for the 5s, 4d, and 4f levels while certain deviations are noted for the 4p term. None of the applied population models reproduce all experimental curves satisfyingly well. In addition, lifetimes are determined experimentally for 7 terms in Zn II, and good agreement with the numerical Coulomb approximation lifetimes is generally found except for some p terms. Beam foil excitation mechanism results for zinc are presented and compared to previous rsults from light projectiles. DOE

N82-25924# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy.

EVIDENCE FOR THE BARYON RESONANCE WITH ISOTOPIC SPIN 5/2 IN n-p INTERACTIONS AT ENERGIES OF 4-5 GeV

A. Abdivaliev, K. Besliu, S. Gruia, A. P. Ierusalimov, P. Kotorobai, V. I. Moroz, A. V. Nikitin, and Yu. A. Troyan 1980 11 p refs Submitted for publication

(JINR-E-1-80-188) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The reaction np yields p pi(+) pi(+) pi(-) pi(-) n was analysed at three incident neutron momenta of 3.83, 4.35 and 5.10 GeV/c. The peak with a mass of 1420 MeV/c(2) and a width of 40 MeV/c(2) was found in the effective mass distributions of p pi(+) pi(+) (n pi(-) pi(-)) combinations at all incident the probable resonance with isotopic spin I=5/2 are equal to (7 + or - 4), energies. The generation cross sections of (11 + or - 3) and (21 + or - 3) mu b at these three momenta, respectively. Characteristics of the anomalies found are in coincidence with predictions for the resonance with I=5/2 using the superconvergence sum rules for reggeon-particle scattering. DOE

N82-25925# Niels Bohr Inst., Copenhagen (Denmark).

ABSENCE OF NEUTRINOS ON A LATTICE. 2: INTUITIVE TOPOLOGICAL PROOF

H. B. Nielsen and M. Ninomiya (Rutherford Lab., Chilton, Engl.) Jan. 1981 30 p refs

(NBI-HE-81-1) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

An intuitive topological proof is given of the no-go theorem for putting Weyl fermions in weak interaction on a lattice, or for constructing chiral invariant lattice QCD, which was proved by a homotypy theory argument previously. This theorem hangs on the existence of the charge (e.g., fermion number), and thus on the complex-field formulation and on locality. If the assumptions for the no-go theorem are relaxed, for instance the existence of the charge, and thus use the real-field formulation, a model can be constructed that has only one two-component field. This model can be assigned only an approximately conserved charge. DOE

N82-25926# Paris XI Univ., Orsay (France). Div. de Physique Teorique.

NUCLEAR INCOMPRESSIBILITY: FROM FINITE NUCLEI TO NUCLEAR MATTER

J. Treiner, H. Krivine, O. Bohigas, and J. Martorell (Univ. Autonoma de Madrid, Cantoblanco, Espagne) Jan. 1981 68 p refs

(DE81-700231; IPNO-TH-81-2) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

The increase of experimental data concerning the giant monopole resonance energy E sub M gives information on the incompressibility modulus of nuclear matter, provided one can extrapolate the incompressibility of a nucleus K sub A defined by E sub M = (h(2)/m K sub A/<r(2) >) (1/2), to the infinite medium. The theoretical interpretation of the coefficients of an A(-1/3)-expansion f K sub A is discussed by studying the asymptotic behavior of two RPA sum rules (corresponding to the scaling and the constrained model), evaluated using self-consistent Thomas-Fermi calculations. It is shown that the scaling model is the most suitable one as it leads to a rapidly converging A(-1/3)-expansion of the corresponding incompressibility K sub A(S), whereas this is not the case with the constrained model. Some semi-empirical relations between the coefficients of the expansion of K sub A(S) are established, which reduce to one the number of free parameters in a best fit analysis of the experimental data. DOE

N82-25927# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Moscow (USSR). Inst. Teoreticheskoj i Ehdsperimentalnoj Fiziki.

THE P ANTI P ATOM SPECTROSCOPY

B. O. Kerbikov 1980 39 p refs

(ITEP-68(1980)) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The nuclear shifts of p anti p atom s levels is considered. The problem is discussed within the framework of a simple model assuming the existence of such an interaction radius R that strong interaction may be neglected for the range r > R and the Coulomb one for the range r < R. The analytic structure of

the S matrix is taken into account. It is shown that the protonium spectrum may be completely rearranged due to the interaction in an n anti n channel. A procedure was developed for the localization of the instability domains of the multichannel system spectrum. The data on the nuclear shifts do not allow qualitative predictions on the position of the nuclear-like state near the threshold.

N82-25928# Lund Univ. (Sweden). Fysiska Inst.
STUDIES OF ENERGY LEVELS AND LIFETIMES IN NEUTRAL AND IONIZED LIGHT ATOMS Ph.D. Thesis
Sven Huldt May 1980 66 p refs
(INIS-MF-6314) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

The spectrum of singly ionized titanium was analyzed by photographic spectral recordings of the light from a hollow cathode. Classified lines in the region 1200 A to 11000 A and term values are reported. Lifetime of the 3p 5 5p levels in neutral argon were measured by the high frequency deflection technique considering the trapping of radiation from the excited 3p 5 4s level. Energy levels and lifetimes of excited states were studied with the beam foil method for selected ions in the atomic number range 7 to 30. Influence of transition probabilities caused by hyperfine interaction for low members of the helium isoelectronic sequence is verified. The oscillator strength for the intercombination transition 1s 2 1S0-1s3p 3 p is measured in beryllium like nitrogen, oxygen and fluorine. Accurate determination of lifetimes for some of the lowest excited levels in Si I - Si IC and Zn II are reported. A large fraction of circularly polarized light is seen in the O VI n = 6 to 7 hydrogenic transition when a 4 MeV beam of oxygen was passed through a tilted carbon foil. DOE

N82-25929# Paris XI Univ., Orsay (France). Inst. de Physique Nucleaire.
STUDY OF MASS ASYMMETRY EFFECT IN THE ENTRANCE CHANNEL FOR DEEP INELASTIC COLLISIONS BETWEEN HEAVY IONS Ph.D. Thesis
S. K. Agarwal 1980 95 p refs In FRENCH
(IPNO-T-79-09) Avail: NTIS (US Sales Only) HC A05/MF A01; DOE Depository Libraries

The reactions Cr-52 + Fe-56 and O-16 + Mo-92 were studied to learn about the influence of the mass asymmetry of the entrance channel on deep inelastic collisions (DIC). Incident energies choosen were 265 MeV for Cr and 187 MeV for O so that the maximum angular momentum is the same in both cases. The experimental results of the quasi-symmetric system (Cr+Fe) show that a large number of fragments have the characteristic properties of fission fragments. However, comparison of these results with those of an asymmetric system (O+Mo), forming the same compound nucleus with higher excitation energy, seems to indicate that these events can not be accounted for by fission and could be considered as DIC products. The distributions of different multidifferential observables were reproduced with the help of a diffusion model, and with the condition of introducing a notion of half life time of the composite system. The half-life seems to vary as a function of mass asymmetry of the entrance channel. DOE

N82-25930# Paris XI Univ., Orsay (France). Inst. de Physique Nucleaire.
STUDY OF THE NUCLEON-ANTINUCLEON INTERACTION. APPLICATION TO CROSS SECTIONS AND BARYONIUM Ph.D. Thesis
B. Moussallam 1980 144 p refs In FRENCH
(IPNO-TH-80-45) Avail: NTIS (US Sales Only) HC A07/MF A01; DOE Depository Libraries

The advances in the nuclear potential which could yield a better understanding of nucleon-antinucleon interaction were studied. Inelastic channels were simulated phenomenologically by a complex potential (V sub (ann)), which is made to obey constraints of range and r-dependence as imposed from general S-matrix principles. Simple models are considered and it is shown that V sub (ann) must be nonlocal, implying a strong dependence on partial wave. The imaginary as well as the core of the real part of the potential are adjusted for each partial wave, the Paris potential is used for the long and intermediate range part. The model is compatible with the existence of quasi nuclear mesons, some of which are very narrow. Nevertheless, a spectrum cannot be predicted accurately because of its strong dependence on the core which is determined only approximately. DOE

N82-25931# Paris XI Univ., Orsay (France). Inst. de Physique Nucleaire.
RELATIVISTIC AND SEPARABLE CLASSICAL HAMILTONIAN PARTICLE DYNAMICS
H. Sazdjian Jan. 1981 100 p refs
(DE81-700141; IPNO-TH-81-4) Avail: NTIS (US Sales Only) HC A05/MF A01; DOE Depository Libraries

Within the Hamiltonian formalism the existence of classical relativistic mechanics of N scalar particles are shown interacting at a distance which satisfies the requirements of Poincare invariance, separability, world line invariance and Einstein causality. The line of approach which is adopted uses the methods of the systems with constraints applied to manifestly covariant systems of particles. The study is limited to the case of scalar interactions remaining weak in the whole phase space and vanishing at large space like separation distances of he particles. Poincare invariance requires the inclusion of many body, up to N body, potentials. Separability requires the use of individual or two body variables and the construction of the total interaction from basic two body interactions. Position variables of the particles are constructed in terms of the canonical variables of the theory according to the world line invariance condition and the subsidiary conditions of the nonrelativistic limit and separability. Positivity constraints on the interaction masses squared of the particles ensure that the velocities of the latter remain always smaller than the velocity of light. DOE

N82-25932# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Moscow (USSR). Inst. of Theoretical and Experimental Physics.
LIGHT EXOTIC ATOMS IN LIQUID AND GASEOUS HYDROGEN AND DEUTERIUM. ATOM ANTI pp, THEORY AND EXPERIMENT
V. E. Markushin 1980 46 p refs
(ITEP-65(1980)) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The deexcitation, absorption and Stark mixing processes in light exotic atoms formed in liquid and gaseous hydrogen (deuterium) are considered, and the method of the cascade calculations are presented. Atom anti pp is studied in detail, calculated are: the populations of atomic levels, the absorption probabilities, and the X-rays yields. DOE

N82-25933# Paris XI Univ., Orsay (France). Inst. de Physique Nucleaire.
ANGULAR DISTRIBUTIONS OF ELASTIC AND QUASI ELASTIC HEAVY ION COLLISIONS. PATTERN ANALYSIS
R. DaSilveira Jun. 1980 21 p refs
(IPNO-TH-80-27) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The emergence, as well as the evolution, of the most typical patterns observed in the angular distributions of elastic scattering and surface transfer between heavy nuclei, is discussed. Starting from the semiclassical approximation, Thom's classification theorem is evoked to further illuminate the connection between these patterns and the collision parameters. DOE

N82-25934# Grenoble Univ. (France). Inst. des Sciences Nucleaires.
ELASTIC AND INELASTIC SCATTERING OF POLARIZED DEUTERONS BY COMPLEX NUCLEI
J. Arvieux, Nguyen VanSen, and G. Perrin May 1980 32 p refs Submitted for publication
(ISN-80-24) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

A review of recent developments in the field of polarized deutron elastic and inelastic scattering by complex nuclei, A > or = 12, is presented. Significant results deduced from the theoretical analyses of the data are pointed out. DOE

N82-25935# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy.
CHARGED MULTIPLICITY DISTRIBUTIONS IN ANTI np

INTERACTIONS AT 6 GeV/c
B. V. Batyunya, I. B. Boguslavsky, I. M. Gramenitsky, N. B. Dashian, R. Lednicky, A. V. Nikitin, L. A. Tikhonova, A. Valkarova, E. G. Boos, T. Temiraliev et al 1980 8 p refs Presented at the 13th Intern. Symp. on Multiparticle Dyn., Belgium
(JINR-E-1-80-164) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Inelastic topological anti np cross sections at 6 GeV/c were determined based on a study of the charged multiplicity distribution in antideuteron-proton collisions at 12 GeV/c. The data were obtained in an exposure of the "Ludmila" JINR 2 m hydrogen bubble chamber at the Serpukhov accelerator. In anti np interactions, average charged multiplicity <n> and its ratio to dispersion, <n>/D were found to be 3.32 + or - 0.13 and 1.86 + or 0.16, respectively. Results are compared with anti pn, anti pp and pp data. DOE

N82-25936# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
RADIATIVE DECAYS OF LIGHT MESONS
A. T. Filippov 1980 6 p refs Submitted for publication
(JINR-E-2-80-280) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

All available data on radiative decays of light mesons except GITA((MU) (FEMALE) (BETA) (BETA)) were found to be in good agreement with eta-eta' mixing angle THETA sub(p) appproximately equal to -19 deg. In matrix elements of the decays OZI-rule is violated, and there is no significant SUsub(3)sup(f) breaking. DOE

N82-25937# Los Alamos Scientific Lab., N. Mex.
MEASUREMENTS OF THRESHOLD BEHAVIOR FOR ONE- AND TWO-ELECTRON PHOTODETACHMENT FROM THE H(+) ION B.S. Thesis, Auburn Univ.
Charles Alan Frost Sep. 1981 239 p refs
(Contract W-7405-eng-36)
(DE82-002599; LA-8976-T) Avail: NTIS HC A11/MF A01

One and two-electron photodetachment from the H(+) ion by a single photon was studied using a crossed beam apparatus. A Q-switched laser beam was directed across the 800 MeV H(+) beam at LAMPF ((ALPHA)=0.842) resulting in Doppler-shifted photon energies in the H(+) barycentric frame, which were tunable from 0.4 eV to 15.5 eV by changing the intersection angle. The particles (e(+), H0, H( )) resulting from photodetachment reactions were magnetically deflected into scintillation detectors allowing the total and partial cross sections for 1e(+) and 2e(+) processes to be separately measured. The 2e(+) signal (H( )) was produced by two different mechanisms, the true signal (BETA) + H(+) (FEMALE) H( ) + 2e(+) and the background process (BETA) + H(+) (FEMALE) H0(n), followed by motional electric field ionization of excited H0. Two-electron photodetachment which had been predicted theoretically was observed for the first time, and the relative cross section was measured from threshold to 15.5 eV. DOE

N82-25938# McElroy (Ralph) Co., Austin, Tex.
CORRECTION OF THE HORIZONTAL CLOSED ORBIT AT ALL ENERGIES
L. Degueurce and A. Nakach 1981 8 p refs Transl. into ENGLISH from "Correction de L'Orbite Fermee Horizontale a Toute Energie" Rept. LSN/SM79/39-DIA07 Commissariat a l'Energie Atomique Jun. 1979
(Contract W-7405-eng-36)
(DE82-003200; LA-tr-81-35) Avail: NTIS HC A02/MF A01

The method followed is accomplished in two steps. At average energy, the closed orbit is corrected by a remote realignment of the focusing quadrupoles by a known quantity. This closed orbit, created by the position adjustment of the quadrupoles, is valid during the whole cycle; but at low energy level, a closed orbit is added because of constant currents or parasitic fields whose effects decrease as the energy level increases. This residual orbit is corrected during the injection by dipolar correction fields, located on the inside of the quadrupoles and fed by direct currents. Therefore, the closed orbit resulting from the superposition of the two types of correction and defects is brought back to + or - 2.5 mm with respect to the center of the quadrupoles. DOE

N82-25939# Officine Galileo S.p.A., Florence (Italy). Space Activity Div.
STUDY OF IMAGE PROCESSING IN A PHOTON DETECTION ASSEMBLY Final Report
G. Matticari and D. Cumeni Paris ESA Jul. 1981 130 p
(Contract ESA-4083/79/NL-SG)
(Rept-482-DT-4; ESA-CR(P)-1533) Avail: NTIS HC A07/MF A01

The design, software, and electronics of a photon detector are described. A lens whose focal plane is coincident with the photocathode external face discriminates the direction of incoming photons. The intersifier stage includes an S-20 type photocathode, curved channel microchannel plate capable of high gain, and a phosphorus screen whose spectral response matches that of the detector. Between the photocathode and the input face of the microchannel plate, a proximity focusing operation permits the photons from the photocathode to enter the microchannels with enough energy to evoke the secondary emission. The optical coupling phosphor CCD matrix array relay optics consist of a fiber optics bundle. A management subroutine decides the kind of operation to be executed during software test activities, i.e., program definition or application program realization. Author (ESA)

N82-26079*# Erlangen-Nuremberg Univ. (West Germany). Inst. fuer Theoretische Physik.
OBSERVABILITY OF ATOMIC LINE FEATURES IN STRONG MAGNETIC FIELDS
Guenter Wunner, H. Ruder, H. Herold, and J. Truemper (Max-Planck-Inst. fuer Physik und Astrophysik, Garching) *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 471-476 refs Sponsored in part by Deutsche Forschungsmeinschaft (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 20H

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N82-25940# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
APPROXIMATE DESCRIPTION OF MULTIPLE SCATTERING IN NUCLEUS-NUCLEUS COLLISIONS AT HIGH ENERGIES
R. Dymarz and A. Matecki 1980 8 p refs In ENGLISH; RUSSIAN summary
(JINR-E-2-80-96) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A new expression for the nucleus-nucleus elastic scattering profile functions was derived. The optical limit, rigid projectile, and rigid target approximations are laid down as the basis of the calculations. The invariant differential cross sections for the (2)H-(12)C elastic scattering are presented. They prove the equivalence of the rigid target and the swarm projectile approximations. At the same time the comparison with the complete multiple scattering calculations shows that for large momentum transfers (q(2)) both the approximations considerably underestimate the effect of quasielastic shadowing. A symmetric version of the rigid nucleus approximation is presented. The example of its application to the (4)He-(4)He scattering shows that the agreement with the complete multiple scattering calculations is quite satisfactory except for very large momentum transfers where some shadowing is still missing. DOE

N82-25941# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energies.
EXPERIMENTS WITH BEAMS OF HIGH-ENERGY NUCLEI AND THE PROBLEM OF RELATIVIZATION OF NUCLEAR WAVE FUNCTIONS: DUBNA-KOSICE-MOSCOW-STRASBOURG-TBILISI-WARSAW COLLABORATION
V. V. Glagolev, R. M. Lebedev, and I. S. Saitov 1980 16 p refs

(JINR-E-1-80-243) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The process of knocking out the nucleon from the relativistic nucleus to nucleus-nucleon interactions is considered in the framework of the "light front" formalism for composite systems. The relativistic nuclear wave functions are introduced which possess definite scaling properties and turn into the well known nuclear wave functions in the nonrelativistic limit. The overlap integral of these wave functions is calculated. The results of theoretical calculations are compared with experimental data on the interactions of 14 He nuclei with hydrogen target at P(4He) = 8.56 GeV/c. A satisfactory agreement with experiment is observed. The importance of similar experiments in a wide range of energy is pointed out. DOE

N82-25942# Japan Atomic Energy Research Inst., Tokyo. Div. of Environmental Safety Research.

RADIOLOGICAL SAFETY STUDIES ON GROUND DISPOSAL OF RADIOACTIVE WASTES. DISTRIBUTION AND MIGRATION OF RADIONUCLIDES IN THE AERATED ZONE

Shinichi Takebe, Tadatoshi Yamamoto, and Yoshiki Wadachi Apr. 1980 14 p refs In JAPANESE; ENGLISH summary

(JAERI-M-8824) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The behavior of radionuclides in an aerated zone, and migration and distribution of Cs-137, Co-60 and Sr-90-Y-90 in an aerated sand layer were examined with a medium scale sand layer model apparatus. The distribution ratio of each radionuclide in vertical direction of the sand layer decreases exponentially, going to further depths; a large part of radionuclide is adsorbed in the upper region, near to the point of downward flow. Two dimensional distribution of each radionuclide in the sand layer is as follows. Migration of Cs-137 is small in both vertical and horizontal directions of the sand layer. That of Co-60 is large in both vertical and horizontal directions. That of Sr-9-Y-90 is small in horizontal direction and large in vertical direction, and its distribution is similar to the case of Cs-137. In conclusion, the differences in migration and distribution between the radionuclides depend on their chemical forms, i.e., ionic or nonionic. S.L.

N82-25943# Ontario Research Foundation, Mississauga.

ASSESSMENT OF METHODS FOR IMMOBILIZING REPROCESSED RADIOACTIVE WASTE

M. K. Murthy and A. D. Baranyi May 1980 153 p refs Sponsored by Atomic Energy Control Board

(INFO-0013) Avail: NTIS (US Sales Only) HC A08/MF A01; DOE Depository Libraries

Nuclear waste forms presently used for the disposal of high level wastes and other potential waste forms under development were studied. The following waste forms were considered: Borosilicate glass, high silica glass, glassceramics, supercalcine ceramics, synroc ceramics, borosilicate glass beads in a metal matrix, supercalcine and synroc ceramics in a metal matrix and coated ceramics. The best developed wasteform, both in terms of overall product quality and process development, is monolithic borosilicate glass. However, hydrothermal instability is a major concern. Borosilicate glass in metal matrix waste form has better properties than monolithic borosilicate glass waste form. The process was proven on a pilot scale. Hence, it is considered very close to monolithic glass in terms of overall development. The product qualities of the other waste forms are better than borosilicate glass. However, process development for these alternative waste forms is still in a conceptual stage. DOE

N82-25944# Los Alamos Scientific Lab., N. Mex.

SPACE NUCLEAR SAFETY AND FUELS PROGRAM Progress Report, May 1981

S. E. Bronisz, comp. Oct. 1981 26 p refs

(Contract W-7405-eng-36)

(DE82-004183; LA-9042-PR) Avail: NTIS HC A03/MF A01

The use of Plutonium 238 in radioisotopic power systems is discussed. A 250 W modular heat source fueled with Plutonium 238 was subjected to impact tests. All six fuel pellets cracked. The welding and weld inspection of the fuel pellet capsules is described. In preparation for overpressure tests of a lightweight radioisotope heater unit, attempts were made to experimentally reach launch pad pressures of 2000 psi. Eight helium release experiments using fragments of fuel pellets were completed. DOE

N82-25945# Los Alamos Scientific Lab., N. Mex.

SPACE NUCLEAR SAFETY AND FUELS PROGRAM Progress Report, Jun. 1981

S. E. Bronisz, comp. Oct. 1981 16 p refs

(Contract W-7405-eng-36)

(DE82-004188; LA-9076-PR) Avail: NTIS HC A02/MF A01

Studies related to the use of Plutonium 238 in radioisotope power systems are presented. Most of the studies discussed are ongoing. A lightweight radioisotope heater unit was tested. Nine calibration tests were completed to prepare for overpressure tests of the unit. A 250 W modular heat source fueled with Plutonium 238 was tested. Its iridium clads were subjected to impact tests. All four clads were cracked on impact. The microstructure of the welds were examined. DOE

74 OPTICS

Includes light phenomena.

N82-25946*# Old Dominion Univ., Norfolk, Va. Dept. of Physics.

N2 PRESSURE - BROADENED O3 LINE WIDTHS AND STRENGTHS NEAR 1129.4 cm-1 Progress Report, 25 Oct. 1980 - 24 Oct. 1981

G. E. Copeland, L. N. Majorana, C. N. Harward, and R. J. Steinkamp Jun. 1982 30 p refs

(Grant NAG1-1)

(NASA-CR-168999; NAS 1.26:168999; PTR-81-10) Avail: NTIS HC A03/MF A01 CSCL 20F

A Beer's Law experiment was performed with a tunable diode laser to find the N2 pressure broadening characteristics of a single O3 absorption line at 1129.426 cm for N2 pressures from 10 to 100 torr (O3 pressure = 3.16 torr). SO2 line positions were used for wavelength calibration. Line shapes were interatively fitted to a Lorentz function. Results were delta (HWHM in MHz) = 47.44 (+ or - 5.34) MHz + 1.730 (+ or - 0.088) MHz/torr *p(torr) with sigma = 0.9897. This intercept compares well with the Doppler O3 - O3 broadened (at 3.16 torr) width of 44.52 Hz. This result in a HWHM line width of 0.44 cm atm at 760 torr and 285 K. The line strengths integrated over delta nu = 0.55 cm were found to be N2 pressure dependent. S.L.

N82-25947# University of Southern California, Los Angeles. Center for Laser Studies.

LOW LOSS OPTICAL WAVEGUIDES IN GLASS FABRICATED BY ELECTRIC FIELD ASSISTED DIFFUSION FROM SILVER Final Report, Aug. 1980 - Sep. 1981

E. Garmire 25 Nov. 1981 59 p refs

(Contract F49620-80-C-0099; AF Proj. 2305)

(AD-A111536; AFOSR-81-0898TR) Avail: NTIS HC A04/MF A01 CSCL 20/6

This report describes continuing research in fabricating low loss glass waveguides for an integrated optics ring interferometer to be used for inertial rotation sensing. During this year progress was made in identifying the losses which occur during diffusion of a waveguide into glass. We developed special optical glass in which we were able to diffuse waveguides with losses which are four times smaller than observed in preliminary experiments in microscope slides. From its mode-dependence, we were able to determine that the residual loss is due to roughness of the surface introduced by the silver during the diffusion. We introduced the technique of laser writing of masks for integrated optics and succeeded in writing a ring channel mask 10 cm in diameter and 10 micrometer wide. The combination of this mask and a straight-line mask provide the capability for producing a ring interferometer of dimensions required for inertial rotation sensing. We have also demonstrated that photoacoustic spectroscopy may be a very useful tool for determining the silver depth profiles in a nondestructive fashion. Author (GRA)

N82-25948# TRW, Inc., Philadelphia, Pa. Research and Development Labs.
DEMOUNTABLE CONNECTOR FOR SINGLE MODE OPTICAL FIBER Final Report, 27 Jun. 1980 - 31 Aug. 1981
John G. Woods Dec. 1981 41 p refs
(Contract N00173-80-C-0238)
(AD-A111229; NRL-80-C-0238-F) Avail: NTIS HC A03/MF A01 CSCL 20/6

A single mode fiber optic connector, suitable for making demountable connections with 80 micron diameter optical fibers, was developed, constructed and tested. The connector uses the four-rod double elbow glass alignment guide principle, previously developed for multimode single fiber connections. To obtain the 1.0 dB insertion loss with the approximately 4 micron diameter single mode core, a liquid filled guide and plastic reservoir system were developed. The TRW/Cinch cylindrical connector package (Optalign (R)) is used, with some modifications, to house the single mode guide and reservoir. The means for stripping, scribing and cleaving the single mode fiber are described, including the specially designed scribing machine. In addition to the connector principles, development and construction work, this report describes the results of tests for insertion loss, temperature cycle, repeated matings and vibration. Author

N82-25949# California Univ., Berkeley. Dept. of Physics.
EXPERIMENTAL TESTS OF THE ASTROMETRIC PRECISION OBTAINABLE WITH A TEN MICRON INTERFEROMETER Final Contract Report, 15 Feb. 1980 - 14 Aug. 1981
Charles H. Townes, E. C. Sutton, and S. Subramanian 18 Jan. 1982 35 p refs Submitted for publication
(Contract N00014-80-C-0383)
(AD-A110511) Avail: NTIS HC A03/MF A01 CSCL 20/6

The purpose of this project was to test whether the relative positions of stars could be measured with an infrared spatial interferometer to high accuracy--that is, 0.1 seconds of arc or better. For such a test, a number of measurements were made on the relative hour angles of three stars, omicron Ceti, alpha Orionis, and R Leonis, each separated by about 50 deg. About ten measurements of omicron Ceti and alpha Ori were made each night for 10 nights during a two-week period. The RMS deviation between measurements on a single night was approximately .07 arc seconds and the RMS variation from night to night among the 10 different nights was 0.08 arc seconds. Similar but less extensive results were obtained on R Leonis. This night-to-night positional accuracy is somewhat better than is normally achieved with the best optical techniques, and clearly of value for the Navy's task of assembling accurate stellar positions. The errors encountered appear to be largely due to mechanical instability of the telescopes used. These telescopes were not designed for astrometry, and had both bearing variations and temperature distortions which are estimated to be comparable with the errors found. Errors due to atmospheric seeing appeared to be substantially smaller than these. We believe this series of tests successfully achieved its objective and demonstrated the usefulness of infrared spatial interferometry for very precise astrometric measurements over large angular separations.
Author (GRA)

N82-25950# Messina Univ. (Italy). Dept. of Physics.
THE OPTICAL SPECTRA OF MOLECULAR AEROSOLS Final Technical Report, Sep. 1978 - Oct. 1981
F. Borghese, P. Denti, G. Toscano, and O. I. Sindoni Oct. 1981 57 p refs
(Grant DA-ERO-78-G-106; DA Proj. 1T1-61102-BH-57)
(AD-A110930) Avail: NTIS HC A04/MF A01 CSCL 20/6

A method to calculate the electromagnetic scattering properties of a cluster of spheres of arbitrary radia and (possibly complex) refractive indexes is proposed. The approach takes proper account of multiple scattering effects through an appropriate addition theorem for Vector Helmholtz Harmonics which is preliminary formulated. No approximation is required but the truncation of the multipolar expansion of the scattered field. Group theory is also used to factorize the resulting system of linear nonhomogeneous equations. Author (GRA)

N82-25951# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DEVELOPMENT OF A BACKWARD STIMULATED RAMAN SCATTERING SYSTEM FOR PULSE COMPRESSION M.S. Thesis
William D. Lindsay Dec. 1981 88 p refs
(AD-A111173; AFIT/GEO/PH/81D-3) Avail: NTIS HC A05/MF A01 CSCL 20/6

A Raman pulse compression system utilizing backward stimulated Raman scattering (BSRS) within a methane gas cell six feet in length was built and tested. A 12 MW giant pulse ruby laser with a pulsewidth of 12 ns(FWHM) was focused within the gas cell with a 10 cm focal length lens. The resulting reverse Stokes pulse at 8704 A had a maximum power of 15 MW and a minimum pulsewidth of 800 ps(FWHM). The peak power of the reverse Stokes pulse as well as the threshold power for BSRS were measured as a function of pressure. The shortest and most intense reverse Stokes pulses were obtained in the pressure range of 150 - 175 psi with an input energy of 125 - 160 mJ. The short, intense pulses produced by this system should be useful in the investigation of events occurring on a subnanosecond time scale such as semiconductor carrier diffusion processes. The competing nonlinear processes of stimulated Brillouin scattering (SBS) and gas breakdown were also investigated and found to limit the efficiency of this system to 10 percent. Author (GRA)

N82-25952# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ALTERNATIVES TO AN EXTENDED KALMAN FILTER FOR TARGET IMAGE TRACKING M.S. Thesis
Paul R. Leuthauser Dec. 1981 278 p refs
(AD-A111144; AFIT/GA/AA/81D-8) Avail: NTIS HC A13/MF A01 CSCL 17/5

Four alternative filters are compared to an extended Kalman filter (EKF) algorithm for tracking a distributed (elliptical) source target in a closed loop tracking problem, using outputs from a forward looking (FLIR) sensor as measurements. These were (1) an EKF with (second order) bias correction term, (2) a constant gain EKF, (3) a constant gain EKF with bias correction term, and (4) a statistically linearized filter. Estimates are made of both actual target motion and of apparent motion due to atmospheric jitter. These alternative designs are considered specifically to address some of the significant biases exhibited by an EKF due to initial acquisition difficulties, unmodelled maneuvering by the target, low signal-to-noise ratio, and real world conditions varying significantly from those assumed in the filter design (robustness). Filter performance was determined with a Monte Carlo study under both ideal and non ideal conditions for tracking targets on a constant velocity cross range path, and during constant acceleration turns of 5G, 10G, and 20G. GRA

N82-25953# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DEPTH-RESOLVED LUMINESCENCE OF GALLIUM ARSENIDE USING ION ETCHING M.S. Thesis
Myron Travis Maclin Dec. 1981 102 p refs
(AD-A111139; AFIT/GEP/PH/81D-6) Avail: NTIS HC A06/MF A01 CSCL 20/2

A system was assembled for obtaining depth-resolved, low-temperature luminescence data from GaAs using ion etching. This system was tested on virgin and silicon implanted, liquid-encapsulated Czochralski (LEC) grown GaAs. It was found to be effective in detecting lattice damage in annealed and unannealed Si-implanted GaAs. GRA

N82-25954# Little (Arthur D.), Inc., Cambridge, Mass.
MODELING THE INFRARED REFLECTANCE AND EMITTANCE OF PAINTS AND COATINGS Final Report, 3 Jan. 1977 - 31 Jan. 1982
James R. Aronson Jan. 1982 54 p refs
(Contracts DDAG29-77-C-0011; DAAG29-81-C-0010)
(AD-A110824; ARO-14076.2-C; ARO-17451.1-C) Avail: NTIS HC A04/MF A01 CSCL 17/5

This report deals with a research program covering an investigation of the use of a theory of the reflectance and emittance of particulate materials as an aid to improving the camouflage properties of various substances. The present contract is a continuation of work pursued under a previous ARO contract

(DAAG29 77 C 0011) and a contract with MERADCOM (DAAK70 79 D 0036). GRA

N82-25955# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.

SPACE/FREQUENCY CONVERSIONS IN IMAGE PROCESSING AND TRANSMISSION Final Technical Report, 30 Sep. 1978 - 29 Sep. 1981

William T. Rhodes Nov. 1981 49 p refs
(Grant AF-AFOSR-3720-78; AF Proj. 2305)
(AD-A111570; AFOSR-81-0899TR) Avail: NTIS HC A03/MF A01 CSCL 20/6

This research program centers on the investigation of a new optical/electronic method for highspeed convolution and correlation of two dimensional imagery. The method, based on frequency-division multiplexing of image samples, is suited to implementation with wideband acoustooptic devices. During the report period the following has been accomplished: Development of a time-integration method for obtaining image output, Development of methods for production of improved encoding/decoding local oscillator distributions, Development of a general Fourier transform scanning hybrid image processor concept, Development of important analogies between space-frequency conversion image processing, time-integration folded spectrum analysis, and Fourier transform holography, and Development of a joint-transform method for space-frequency conversion image processing. These developments enhance greatly the prospects that the space-frequency conversion scheme can be satisfactorily implemented in a wideband image processing system. GRA

N82-25956# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.

ALTARELLI-PAISI EQUATIONS AS RENORMALIZATION GROUP EQUATIONS FOR THE COEFFICIENTS OF THE NONLOCAL LIGHT-CONE EXPANSIONS

M. Bordag (Karl-Marx-Univ.) and D. Robachik 1980 18 p refs Submitted for publication
(JINR-E-2-80-613) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

In the framework of renormalization perturbation theory the relations between local and nonlocal light-cone expansions are investigated. All calculations are done in scalar field theory. Both expansions are discussed in the case of forward scattering. It is pointed out that the Altarelli-Parisi equations are renormalization group equations for the coefficients of nonlocal light-cone expansion. DOE

N82-25957# Wien Univ. (Austria). Formal- und Naturwissenschaftliche Fakultaet.

INVESTIGATIONS ON FIBEROPTIC BEHAVIOUR DURING GAMMA IRRADIATION Ph.D. Thesis

Josef Siehs Dec. 1980 123 p refs In GERMAN; ENGLISH summary
(INIS-mf-6417) Avail: NTIS (US Sales Only) HC A06/MF A01; DOE Depository Libraries

The behavior of bulk glasses and fiber optics under gamma irradiation and two types of annealing processes (thermal and optical) were investigated. The samples were irradiated in the thermal column of the TRIGA Mark II reactor. The irradiation induced losses of transmission were measured in a dual beam spectrophotometer. The transmission was measured one hour after reactor shut-down. Thermal annealing was done at 300, 400 and 500 C. Photo bleaching was investigated with a quartz-lamp, an arc-lamp and an UV-laser light. DOE

N82-25958# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Afd. Visuologie.

A SIMPLE SEARCH MODEL FOR IMAGE INTENSIFYING TELESCOPES

A. vanMeeteren and J. J. Schreuder Jan. 1981 23 p refs In DUTCH; ENGLISH summary
(Contract A74/KL/013)
(IZF-1981-2; TDCK-75273) Avail: NTIS HC A02/MF A01

The effects of image quality factors and telescope movement factors on the time required to scan a terrain sector in search of a target are distinguished by separate measurements with fixed and moving intensifying telescope. With the telescope fixed the detection time is measured for objects in the central part of the field of view. The detection time represents the image quality factors. With the telescope moving, the scan time, defined as the reciprocal of the angular velocity in the stationary phase of the sweep, is measured. A simple linear relation is found between scan time and detection time whereby the multiplicator stands for the movement factors, in particular the size of the field of view. Author (ESA)

N82-25959# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Afd. Beheer/Psychologie.

CONSPICUITY OF MILITARY ROUTE INDICATORS AT NIGHT

A. Huigen Sep. 1981 8 p In DUTCH; ENGLISH summary
(Contract A79/KL/144)
(IZF-1981-19; TDCK-75530) Avail: NTIS HC A02/MF A01

The conspicuity of military route indications was studied. Conspicuity enhancing by diffuse reflecting and retroreflecting materials was investigated. The indicators were observed from trucks and landrovers moving in convoy. Retroreflecting strips along the sides of the indicators give best results. Encapsulated lens rather than enclosed lens materials are advocated. Author (ESA)

N82-25960# Systemberatung Informatik, Karlsruhe (West Germany).

DEVELOPMENT OF A LIQUID CRYSTAL LIGHT GATE (LCLG) FOR OPTICAL DATA PROCESSING Final Report

M. Bohner, H. Kazmierczak, and F. Zimmermann Paris ESA Oct. 1981 159 p refs
(Contract ESTEC-4322/80)
(ESA-CR(P)-1534) Avail: NTIS HC A08/MF A01

Two LCLG cells were manufactured and tested in order to ascertain performance achievable by this type of incoherent-to-coherent image converter in optical computing equipment. Reflected light intensity depending on polarization direction, supply voltage and supply voltage and supply voltage frequency was tested. Results are inconclusive. Author (ESA)

N82-26070*# Northwestern Univ., Evanston, Ill. Dept. of Physics and Astronomy.

X-RAY IMAGING ABOVE 3 keV

Melville P. Ulmer *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 325-334 ref
(For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 20F

N82-26071*# California Univ., San Diego. Center for Astrophysics and Space Sciences.

TEMPORAL APERATURE MODULATION

Raymond J. Proctor *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 35-348 refs
(For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 20F

N82-26080*# Argonne National Lab., Ill.

A NEW METHOD FOR FOCUSING AND IMAGING X-RAYS AND GAMMA-RAYS WITH DIFFRACTION CRYSTALS

Robert K. Smither *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 477-495 refs
(For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 20F

N82-26083*# Danish Space Research Inst., Lyngby.

CYLINDRICAL CRYSTAL IMAGING SPECTROMETER (CCIS) FOR COSMIC X-RAY SPECTROSCOPY

Herbert W. Schnopper and Paul O. Taylor (Harvard-Smithsonian Center for Astrophysics) *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 527-547 refs
Sponsored in part by DOE (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 20F

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N82-25961*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

RESULTS AND COMPARISON OF HALL AND DW DUCT EXPERIMENTS

J. Marlin Smith and J. L. Morgan 1982 10 p refs Proposed for presentation at the 20th Symp. on Eng. Aspects of Magnetohydrodyn., Los Angeles, 14-16 Jun. 1982

(Contract DE-AI01-77ET-10769)

(NASA-TM-82864; DOE/NASA/10769-25; E1233; NAS 1.15:82864) Avail: NTIS HC A02/MF A01 CSCL 20I

Experimental data from recent tests of a 45 deg diagonal wall duct are presented and compared with the results of a similar Hall duct. It is shown that while the peak power density of the two devices is approximately equal that the diagonal wall duct produces greater total power output due to its ability to better utilize the available magnetic field. Author

N82-25962# European Space Agency, Paris (France).

THE GIOTTO SPACECRAFT GAS AND PLASMA ENVIRONMENTS

W. R. Burke, comp. Feb. 1982 63 p refs Proc. of Workshop Series, Noordwijk, Netherlands, 1980 - 1981

(ESA-SP-187; ISSN-0379-6566) Avail: NTIS HC A04/MF A01

Investigations of interactions between the Giotto spacecraft and Halley's comet interactions, updated in order to account for a 68 km/sec (as opposed to 57) flyby velocity. Ionization effects on measurements are considered and electrostatic charging of the spacecraft is discussed. Models are presented for differential charging of the solar panels. For individual titles, see N82-25963 through N82-25968.

N82-25963# Max-Planck-Institut fuer Kernphysik, Heidelberg (West Germany).

PRODUCTION OF SECONDARY PARTICLES BY NEUTRAL AND IONIZED COMETARY GAS AND DUST IMPACTING ON THE SHIELD OF THE GIOTTO SPACECRAFT

N. Pailer and E. Gruen *In* ESA GIOTTO Spacecraft Gas and Plasma Environ. Feb. 1982 p 1-14 refs (For primary document see N82-25962 16-75)

Avail: NTIS HC A04/MF A01

Total ion and electron production rates in the plasma cloud around the Giotto spacecraft are estimated, based on updated models of particle impact on the Halley Probe shield. At 500 km from the comet nucleus, 1.6 times 10 to the 19th power molecules/sec hit the spacecraft shield, releasing 3.2 times 10 to the 19th power neutral secondaries, 1.6 times 10 to the 14th power to 1.6 times 10 to the 13th power ions, and 3.2 to 6.4 times 10 to the 18th power electrons. The shield is assumed to be covered by a 1 to 10 micron thick gold layer. Dust particles produce a total of 3 times 10 to the 19 th power ions and electrons at the same distance. At a fly-by speed of 69 km/sec, the energy is 24 eV per amu. The mean components of the cometary gas hit the shield with 432 eV in the case of H20, and 1056 eV in the case of C02. These interactions result in the release of secondary particles. Author (ESA)

N82-25964# Hochschule der Bundeswehr, Neubiberg (West Germany). Fachbereich Luft- und Raumfahrttechnik.

UPDATE OF THE IMPACT IONIZATION PROBLEM

K. Hornung *In* ESA GIOTTO Spacecraft Gas and Plasma Environ. Feb. 1982 p 15-19 refs (For primary document see N82-25962 16-75)

Avail: NTIS HC A04/MF A01

Model calculations on the impact ionization of Fe particles are updated in order to account for an impact velocity of w = 68 km/sec, as well as for variations of the shield material (aluminum and gold). Extrapolation of previous shock wave entropies (S) gives values between 95, + or - 5, and 108, + or - 5, cal/k mole, for u sub p between 42 and 55 km/sec, where u sub p = w/1 + the square root of the density ratio of the impacting micrometeorite particle and the shield material. The expansion isentropes for u sub p = 42 km/sec, S = 95 cal/k mole, and u sub p = 55 km/sec, S = 108 cal/k mole were determined for a partly ionized Fe gas. The degrees of ionization at the end of the recombination phase are 40% and, 60% respectively i.e. drastic variations of the impacting particle/shield ratio cause variations in the degree of ionization of only a factor of 1.5. Gold coatings should have no serious disadvantages if shock wave ionization is a minor consideration. Author (ESA)

N82-25965# Technische Hochschule, Darmstadt (West Germany).

ELECTROSTATIC CHARGING OF THE GIOTTO SPACECRAFT DUE TO NEUTRAL GAS IMPACT

H. Maassberg and U. Isensee *In* ESA GIOTTO Spacecraft Gas and Plasma Environ. Feb. 1982 p 21-24 refs (For primary document see N82-25962 16-75)

Avail: NTIS HC A04/MF A01

The case for a gold coating on the Giotto spacecraft front shield is argued. Previous studies show that the fraction of emitted ions of sputtered surface material is least for gold, and that relative secondary electron yield is nearly constant for all surface materials. Gold coatings have a relative ion yield between - 1 million and - 0.000,001, with a monotonic potential structure. The positive floating potential is determined by balancing the electron currents and is strongly shielded by the emitted electrons alone. The value of the floating potential, calculated by balancing the current densities of emitted particles, depends mainly on the ambient plasma properties. Author (ESA)

N82-25966# Technische Hochschule, Darmstadt (West Germany).

DIFFERENTIAL CHARGING MODEL OF SOLAR PANELS

H. Maassberg and U. Isensee *In* ESA GIOTTO Spacecraft Gas and Plasma Environ. Feb. 1982 p 25-33 refs (For primary document see N82-25962 16-75)

Avail: NTIS HC A04/MF A01

Two-dimensional (cylindrically symmetric thick sheath approximation) and three dimensional (spherically symmetric) models of GIOTTO solar panel charging are presented. An element Josef Siehs Dec.

with a fixed potential at one plate, representing the floating potential of the inner structure of the spacecraft. This capacitor is charged by the current density of photoelectrons and by plasma electrons leaving or striking the surface. The charging equation can be integrated numerically, using the current densities of the photoelectrons and ambient plasma electrons. An iterative procedure is employed in order to satisfy the boundary value of the surface potential on solar panels. Results are similar for both models, with differences occuring only on the sunlit side of the panels. Near the comet nucleus, differential charging of 10V is predicted. Plasma analyzer functioning will not be affected by this charging. Author (ESA)

N82-25967# Los Alamos Scientific Lab., N. Mex.

ESTIMATES OF A SPACECRAFT INDUCED GAS CLOUD AND ITS EFFECTS ON MEASUREMENT OF AMBIENT PARTICLES DURING A FAST FLYBY OF COMET HALLEY

D. T. Young *In* ESA GIOTTO Spacecraft Gas and Plasma Environ. Feb. 1982 p 35-46 refs (For primary document see N82-25962 16-75)

Avail: NTIS HC A04/MF A01

The possibility of a large gas cloud being induced around the GIOTTO spacecraft by particle sputtering, outgassing, and dust impact vaporization on the ram direction surface is considered. Analogy with Earth orbiting satellites and predictions of models of the GIOTTO gas environment and Halley coma suggest that a cloud will form, leaving the shield surface at low velocities relative to the 69 km/sec flyby velocity. It becomes compressed between the coma gas and the satellite. Cometary neutral gas can in turn collide inelastically with the GIOTTO cloud, producing spurious ionization and dissociation of cometary material. This amounts to 10% of the total ambient ion flux at 1000 km from cometary nucleus. The apogee boast motor cover shield should be closed as late as possible, allowing maximum time for outgassing of the burnt out motor. Gold thickness on the shield should be increased to 50 microns in order to reduce the amount of aluminum vapor produced by dust impact. Author (ESA)

N82-25968# European Space Research and Technology Center, Noordwijk (Netherlands) Space Science Dept.
CONSIDERATIONS ON SURFACE POTENTIALS, WAKE EFFECTS AND RELATED EXPERIMENTAL INVESTIGATIONS ASSOCIATED WITH A COMETARY FLYBY
Rejean J. L. Grard *In* ESA GIOTTO Spacecraft Gas and Plasma Environ. Feb. 1982 p 47-57 refs (For primary document see N82-25962 16-75)
Avail: NTIS HC A04/MF A01

Electric charge distribution on the Giotto spacecraft surface and its near environment are considered in order to assess differential charging possibilities and the magnitude of associated electric potentials. Impact ionization effects on Pioneer Venus orbiter measurements are reviewed, and laboratory investigation of a probe submitted to neutral gas impact is summarized. Evidence suggests that the spacecraft surface can be divided into sections which interact in distinctly different ways with the environment. If the surface is not conductive, differential charging occurs. The surface potentials lie between - 20 and + 20V. The outer surface of the shield floats at a positive potential; surfaces in the wake develop, if insulated, a negative potential. In order to minimize the level of possible interferences, all exposed metallic parts should be electrically connected to the structure and no insulator should be located in the wake. Author (ESA)

N82-25969# Naval Research Lab., Washington, D. C.
XUV AND X-RAY DIAGNOSTICS OF RELATIVISTIC ELECTRON BEAM GENERATED PLASMAS Final Report, 1978 - 1980
R. D. Bleach, P. G. Burkhalter, and D. J. Nagel 8 Feb. 1982 44 p refs
(DNA Proj. G37-MAXY; DNA Proj. T99-QAXI)
(AD-A110893; NRL-MR-4732) Avail: NTIS HC A03/MF A01 CSCL 20/7

XUV and X-ray plasma diagnostics were performed on several relativistic electron beam generators. The data yield information on the spectral, temporal and spatial behavior of radiation in the 40 eV-6 keV range for the elements Al, Ti, Cr, Fe, and Ni as well as the noble gases Ne, Ar, Kr, and Xe. Temperatures, electron densities, and emitting volume of the plasmas were determined by direct measurement and comparison with theoretical calculations. These results provide phenomenological data which both characterizes the plasmas empirically and serves to test plasma models. Author (GRA)

N82-25970# Cornell Univ., Ithaca, N. Y. Lab. of Plasma Studies.
ON KRAICHNANS DIRECT INTERACTION APPROXIMATION AND KOLMOGOROFF'S THEORY IN TWO-DIMENSIONAL PLASMA TURBULENCE
R. M. Kulsrud (Princeton Univ.) and R. N. Sudan Apr. 1981 12 p refs Submitted for publication
(Contract N00014-79-C-0308)
(AD-A111508; LPS-293) Avail: NTIS HC A02/MF A01 CSCL 20/9

The nonlinear damping in a strongly turbulent convecting plasma computed by Kraichnan's modified direct interaction approximation and the power spectrum are rederived in a physically transparent form using Kolmogoroff's theory of turbulence. Author (GRA)

N82-25971# Naval Research Lab., Washington, D. C.
RETURN-CURRENT-DRIVEN INSTABILITIES OF PROPAGATING ELECTRON BEAMS
Han S. Uhm and Martin Lampe 5 Mar. 1982 33 p refs
(ARPA Order 3718; ARPA Order 4395)
(AD-A111911; NRL-MR-4767) Avail: NTIS HC A03/MF A01 CSCL 29/9

A stability analysis is performed for the first nine transverse modes (azimuthal mode number plus radial mode number $<$ or $=$ 3) of a self-pinched relativistic electron beam propagating in a collisional plasma. Only frequencies omega in the range omega tau sub d $<$ 1 are considered, where tau sub d is the dipole magnetic decay length. For such modes, the presence of plasma return current is the only destabilizing mechanism. Paraxial flow, space charge neutrality, and a flat radial profile of beam density are also assumed. Within these limitations an exact analysis of the linearized Vlasov stability problem is carried out in closed form. For each mode, the instability threshold, growth rate, and conditions for oscillatory vs. pure growth are determined. For beams with a moderate return current fraction, the hose, sausage and axial hollowing modes appear to be particularly dangerous. GRA

N82-25972# Japan Atomic Energy Research Inst., Tokyo. Fusion Reactor System Lab.
PRELIMINARY STUDY OF SWIMMING POOL TYPE TOKAMAK REACTOR (SPTR)
Aug. 1980 89 p refs In JAPANESE; ENGLISH summary
(JAERI-M-9050) Avail: NTIS (US Sales Only) HC A05/MF A01; DOE Depository Libraries

In order to relieve the difficulties of repair and maintenance which are the most serious problem in a Tokamak reactor, a concept of swimming pool type reactor was proposed. A preliminary study on the feasibility of the concept was carried out. Because blankets may be easily replaced in this reactor, this concept will have a wide applicability for an experimental reactor which seems still have many ambiquities remaining in plasma physics and reactor structure design. The items covered are: reactor concept, plasma vacuum boundary, blanket structure, tritium breeding, sheilding, induced radioactivity, repairs and maintenance, and overall evaluation. Judging from the results obtained, this concept is promising and deserves a more detailed study. DOE

N82-25973# Japan Atomic Energy Research Inst., Tokyo. Div. of Thermonuclear Fusion Research.
KINETIC THEORY OF KINK-LIKE INSTABILITIES
Kimitaka Itoh and Sanae Inoue Jul. 1980 26 p refs In JAPANESE; ENGLISH summary
(JAERI-M-8975) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The kinetic theory of the drift tearing mode in a finite (ALPHA), collisionless inhomogeneous cylindrical Tokamak was investigated. It is found that: when the density is low, kinetic drift tearing modes are unstable, while they become stabilized as the density increases; the medium m (poloidal mode number) modes have smaller growth rate; and the electron temperature gradient further stabilizes them. Due to the magnetic shear and finite (ALPHA) value, out going drift wave is associated with the tearing mode and hence the ion Landau damping stabilizes the mode when (ALPHA) increases. The local current density is found to be crucial for the instability. It is noted that the stability criterion of MHD tearing mode, (RADICAL)' $>$ 0 ((RADICAL)': jump of the logarithmic derivative of B tilde sub(r) across the mode rational surface), is no longer valid for kinetic tearing mode. For future Tokamak parameters, low and medium m ($2 <$ or $=$ m < 50) kinetic drift tearing modes are found to be stable in a cylindrical geometry. DOE

N82-25974# Oak Ridge National Lab., Tenn.
AMBIPOLAR POTENTIAL AND ITS EFFECTS ON THE CONFINEMENT PARAMETERS OF THE EBT PLASMA
T. Uckan, R. J. Colchin, W. A. Davis, G. R. Haste, D. L. Hillis, and L. Solensten (Rensselaer Polytechnic Inst.) Oct. 1981 43 p refs
(Contract W-7405-eng-26)
(DE82-000826; ORNL/TM-7897) Avail: NTIS HC A03/MF A01

The plasma parameters in the ELMO Bumpy Torus depend on the microwave heating power P/sub (SIGMA)/ and on the neutral as pressure p/sub o/, both of which define the operating regime (mode) of the device. In order to assess interrelationships between various confinement parameters, radial transport was studied by incorporating experimental observations into model calculations. Experimentally, the ambipolar potential well phi is measured and is one of the important parameters that strongly affect the confinement properties. P/sub (SIGMA)/, P/sub o/, and phi were used in transport modeling to predict the scaling of the density (n) and temperatures (T/sub e/, T/sub i /) with these quantities. The scaling calculations are based on neoclassical theory of transport coefficients and experimental observations. A quadratic potential profile and almost flat n and T/sub e/ profiles are assumed. DOE

N82-25975# Mathematical Sciences Northwest, Inc., Bellevue, Wash.

NUMERICAL STUDIES OF A FIELD-REVERSED THETA-PINCH PLASMA

R. D. Milroy and J. U. Brackbill Nov. 1981 45 p refs
(Contract DE-AC06-80ER-53098)
(DE82-004511; MSNW-81-1158-2) Avail: NTIS HC A03/MF A01

A two dimensional magnetohydrodynamic computer code was used to model the formation of a field reversed theta pinch plasma. The simulations were performed in the parameter range of the recent FRX-B experiments. It was found that an anomalous resistivity is required to explain the observed decay of the reversed magnetic flux. The reconnection process was found to be sensitive to the density and amount of trapped reverse bias flux but insensitive to the assumed magnitude of anomalous resistivity. The reconnection process is more rapid and the axial plasma motion induced by reconnection is more pronounced for larger bias flux. If a straight coil is used instead of the usual shaped coil (end mirrors) full reconnection does not occur for low initial bias fields. These results are in general agreement with FRX-B observations. DOE

N82-25976# Mathematical Sciences Northwest, Inc., Bellevue, Wash.

FLUX-TRAPPING DURING THE FORMATION OF FIELD-REVERSED CONFIGURATIONS

W. T. Armstrong, D. G. Harding, E. A. Crawford, and A. L. Hoffman Oct. 1981 47 p refs
(Contract DE-AC06-80ER-53096)
(DE82-004043; MSNW-81-1144-5) Avail: NTIS HC A03/MF A01

Optimized trapping of bias flux during the early formation phases of a Field Reversed Configuration was studied experimentally on the field reversed theta pinch TRX-1. An annular z-pinch preionizer was employed to permit ionization at high values of initial reverse bias flux. Octopole barrier fields are pulsed during field reversal to minimize plasma/wall contact and associated loss of reverse flux. Also, second half cycle operation was examined in obtaining very high values of reverse flux. Flux loss is generally observed to be governed by resistive diffusion through a current sheath at the plasma boundary, rather than flux convection to the plasma boundary. Trapped reverse flux at the time of field reversal, as well as after the radial implosion, is observed to increase with the applied bias field. This increase is greatest, and in fact nearly linear with bias field, when barrier fields are employed. Barrier fields also appear to broaden the current sheath, which results in some flux loss and a less dynamic radial implosion. A general model and one dimensional simulation of flux loss is described and correlated with experimental results. DOE

N82-25977# Maryland Univ., College Park. Plasma Physics Div.

TILT AND SHIFT-MODE STABILITY WITH LINE TYING Interim Report

J. M. Finn and A. Reiman 23 Oct. 1981 57 p refs Sponsored in part by the Office of Naval Research
(Contract DE-AI01-76ET-53020)
(DE82-002087; NRL-MR-4610) Avail: NTIS HC A04/MF A01

Magnetohydrodynamic stability of force free spheromak plasmas to $n = 1$ free boundary tilt and radial shift modes was studied. The exterior region of open field lines is treated either as a conducting plasma or as a vacuum. In the former case the effect of line tying of the open field lines is present and is found to improve stability greatly. The equilibria which have optimum stability properties to the tilt and shift modes have a length to diameter ratio of 0.6, and can be stable with conducting walls at a relatively large distance. DOE

N82-25978# Georgia Inst. of Tech., Atlanta. School of Nuclear Engineering.

RIPPLE REDUCTION POLOIDAL FIELD COILS FOR TOKAMAKS

Glenn Bateman Mar. 1981 13 p
(Contract DE-AS05-78ET-52025)
(DE82-003374; GTFR-26) Avail: NTIS HC A02/MF A01

Ripple reduction poloidal field coils consisting of dipole coils placed above and below the Tokamak plasma, are designed to produce the vertical field needed for plasma equilibrium and, at the same time, to reduce magnetic ripple from the discrete toroidal field coils. A design is presented which reduces ripple by an order of magnitude near the midplane of an eight TF coil Tokamak fusion reactor. DOE

N82-25979# Georgia Inst. of Tech., Atlanta. School of Nuclear Engineering.

RIPPLE REDUCTION POLOIDAL FIELD COILS FOR TOKAMAK FUSION REACTORS

Glenn Bateman Oct. 1981 12 p refs
(Contract DE-AS05-78ET-52025)
(DE82-003534; GTFR-28) Avail: NTIS HC A02/MF A01

Ripple reduction poloidal field coils consist of dipole magnetic coils placed above and below the plane of a tokamak plasma in order to produce the vertial and shaping field needed for plasma equilibrium and at the same time to reduce the magnetic ripple from discrete atoroidal field (TF) coils. A design is presented which reduces the ripple produced by 8 TF coils with INTOR dimensions from more than 2% to less than 0.1% throughout the plasma. With this design, it is found that the poloidal field from the coils can be adjusted independent of the ripple reduction. Coil currents are found for which there are computed free-boundary plasma equilibria with elongated cross section. DOE

N82-25980# Georgia Inst. of Tech., Atlanta. School of Nuclear Engineering.

INTERNATIONAL TOKAMAK REACTOR CONCEPTUAL DESIGN OVERVIEW

Weston M. Stacey, Jr. Sep. 1981 24 p refs Presented at the IAEA Technical Comm. Meeting and Workshop, Tokyo, 5-16 Oct. 1981
(Contract DE-AS05-78ET-52025)
(DE82-003533; GTFR-27) Avail: NTIS HC A02/MF A01

The objective of the Phase-I workshop was to develop a conceptual design of the INTOR experiment. The design aspects agreed upon as a result of that meeting are described. DOE

N82-25981# Los Alamos Scientific Lab., N. Mex.

MODULAR STELLARATOR FUSION REACTOR CONCEPT

R. L. Miller and R. A. Krakowski Aug. 1981 161 p refs
(Contract W-7405-eng-36)
(DE82-001883; LA-8978-MS) Avail: NTIS HC A08/MF A01

A steady-state ignited, DT-fueled, magnetic fusion reactor is proposed for use as a central electric-power station. The MSR concept combines the physics of the classic stellarator confinement topology with an innovative, modular-coil design. Parametric tradeoff calculations are described, leading to the selection of an interim design point for a 4-GWt plant based on Alcator transport scaling and an average beta value of 0.04 in an $1 = 2$ system with a plasma aspect ratio of 11. The physical basis of the design point is described together with supporting magnetics, coil-force, and stress computations. T.M.

N82-25982# Helsinki Univ. (Finland). Research Inst. for Theoretical Physics.

PLASMONS IN CLASSICAL NON-ABELIAN GAUGE THEORIES

K. Kajantie and C. Montonen 1980 24 p refs
(HU-TFT-80-19) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Collective oscillations of matter interacting via a classical non-Abelian gauge field are discussed. General equations of motion are derived. Every gauge group is shown to lead to effectively Abelian oscillations corresponding to oscillations of the additive quantum numbers of the group. Examples of genuinely non-Abelian oscillatory solutions are presented. DOE

N82-25983# Los Alamos Scientific Lab., N. Mex.

EQUILIBRIUM CONSTRAINTS APPLIED TO RMF-DRIVEN COMPACT TOROID DEVICES

Kenneth F. McKenna Nov. 1981 29 p refs
(Contract W-7405-eng-36)
(DE82-004683; LA-9024-MS) Avail: NTIS HC A03/MF A01

The rotating-magnetic-field technique was considered as a

possible means of generating-magnetic-field technique was considered as a possible means of generating and sustaining a field-reversed configuration (FRC). Analytical expressions for the time evolution of the rotating-field and ohmically-heated-plasma parameters are derived and reported for a loss-less equilibrium FRC. The parameters for proof-of-concept and reactor-size devices are also presented. DOE

N82-25984# Los Alamos Scientific Lab., N. Mex.
ELMO BUMPY TORUS REACTOR AND POWER PLANT: CONCEPTUAL DESIGN STUDY
C. G. Bathke, D. J. Dudziak, R. A. Krakowski, W. B. Ard, D. A. Bowers, J. W. Davis, D. A. DeFreece, D. E. Driemeyer, R. E. Juhala, R. J. Kashuba et al Aug. 1981 902 p refs Prepared in cooperation with McDonnell Douglas Astronautics Co., St. Louis, Parsons (Ralph M.) Co., Pasadena, Calif., General Dynamics Convair, San Diego, Calif., and JAYCOR, San Diego, Calif.
(Contract W-7405-eng-36)
(DE82-002437; LA-8882-MS) Avail: NTIS HC A99/MF A01

A complete power plant design of a 1200-MWe ELMO Bumpy Torus Ractor (EBTR) is presented. An emphasis is placed on those features that are unique to the EBT confinement concept, with subsystems and balance-of-plant items that are more generic to magnetic fusion being adapted from past, more extensive Tokamak reactor designs. Similar to the latter Tokamak studies, this conceptual EBTR design also emphasizes the use of conventional or near state-of-the-art engineering technology and materials. An emphasis is also placed on system accessibility, reliability, and maintainability, as these crucial and desirable characteristics relate to the unique high-aspect-ratio configuration of EBTs. Equal and strong emphasis is given to physics, engineering/technology, and costing/economics components of this design effort. Parametric optimizations and sensitivity studies, using cost-of-electricity as an object function, are reported. Based on these results, the direction for future improvement on an already attractive reactor design is identified. DOE

N82-25985# McElroy (Ralph) Co., Austin, Tex.
CALCULATION OF THE DYNAMICS OF A SHAPED LINER FOR QUASISPHERICAL PLASMA COMPRESSION
N. P. Kozlov, R. Kh. Kurtmullaev, V. N. Semenov, V. I. Khvesyuk, and A. V. Yaminskii 1981 20 p refs Transl. into ENGLISH of "Raschet Dinamiki Profilirovannogo Lainera Klia Kvazisfericheskogo Szhatiia Plazmy" Rept. IAE-3384/7 Inst. Atomnoi Energii, Moscow, 1981
(Contract W-7405-eng-36)
(DE81-030650; LA-tr-81-25; IAE-3384/7) Avail: NTIS HC A02/MF A01

Thermonuclear synthesis is initiated by a method which utilizes compression and retention of plasma in a magnetic field with the aid of a heavy metal liner. Megagauss magnetic fields and plasma pressures of ten billion to one hundred billion N/sqm can be achieved in doing so. The versions include an approach based on the idea of quasispherical compression of a compact toroidal structure with closed magnetic field by a liner. The plasma toroid with closed field is injected from a formation chamber into the cavity of a liner which is initially cylindrical. In the general case, a central conductor is positioned on the axis of the system in order to create a stabilizing toroidal field when a Tokomak type of toroid structure is used. DOE

N82-25986# McElroy (Ralph) Co., Austin, Tex.
CALCULATION OF QUASISPHERICAL LINER COMPRESSION IN A COMPACT TOROID
V. V. Belikov, V. M. Goloviznin, R. Kh. Kurtmullaev, and V. N. Semenov 1981 17 p refs Transl. into ENGLISH of "Raschet Kvazisfericheskogo Lainernogo Szhatiia Kompaktnogo Toroida" Rept. IAE-3391/16 Inst. Atominoi Energii (Moscow), 1981
(Contract W-7405-eng-36)
(DE81-030649; LA-tr-81-24) Avail: NTIS HC A02/MF A01

The evolution of a compact toroid as the volume and shape of the cavity changes is considered all the way up to the values of the degree of compression K which are of practical interest, i.e., K approx. = 1000, at which thermonuclear plasma parameters can be achieved. DOE

N82-25987# Los Alamos Scientific Lab., N. Mex.
NUMERICAL SOLUTIONS OF THE FOKKER-PLANCK CHARGED PARTICLE TRANSPORT EQUATION
Anthonio Andrade Sep. 1981 120 p refs
(Contract W-7405-eng-36)
(DE82-002960; LA-8985-T) Avail: NTIS HC A06/MF A01

Two numerical methods are developed to solve the Fokker-Planck charged particle transport equation by simple and efficient means, and without approximation to the collision term. The first of these methods demonstrates that the kinetic transport equation can be integrated to yield the time dependent distribution function of test particles f/sub a/ (r,v,t) in a fully implicit manner by a combination of S/sub n/ methodology with a matrix factorization technique. The second technique that is developed is an implicit Monte Carlo method which is suitable for transport problems in field free and externally magnetized plasmas. Here the transport of test particles in background Maxwellian plasmas is based on probabilities derivable from the FP equation, such as the expected time for deflection and the expected time of energy exchange. DOE

N82-25988# Georgia Inst. of Tech., Atlanta.
FUSION RESEARCH PROGRAM, 1981 Final Report
Weston M. Stacey, Jr. Apr. 1981 6 p refs
(DE81-028655; DOE/ET-52049/T1) Avail: NTIS HC A02/MF A01

Work performed in the Georgia Tech Fusion Research Program during FY 1981 under two research contracts is listed. Tasks related to coordinating the United States participation in the International Tokamak Reactor Workshop performed. Related to plasma systems analysis topics were performed. A summary of the work performed, a listing of persons involved and a list of publications in which the work is described in detail are included. DOE

N82-25989# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
HIGH FREQUENCY PROBE CIRCUITS FOR PLASMA DIAGNOSTICS
Lennart Lindberg Dec. 1981 29 p refs
(TRITA-EPP-81-08; ISSN-0348-7539) Avail: NTIS HC A03/MF A01

Probe circuits used in quantitative measurement of high frequency electric fields in plasmas are analyzed. Badly defined circuits are shown to respond partly to potential, partly to electric field fluctuations, thus giving ambiguous results. Twin probes for electric field measurements overcome this difficulty. The design and optimum operation of a high frequency interferometer is described as well as its use in measuring the dispersion function and degree of coherence of a field created by beam-plasma interaction. Author (ESA)

N82-25990# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.
PLASMA BALANCE EQUATIONS BASED ON ORBIT THEORY Research and Training Programme on Controlled Thermonuclear Fusion and Plasma Physics (EUR-NE)
B. Lehnert Jan. 1982 38 p refs
(TRITA-PFU-82-01; ISSN-0348-7644) Avail: NTIS HC A03/MF A01

Finite Larmor radius phenomena are analyzed, without use of the Vlasov equation, by exploiting balance equations based on orbit theory and the particle distribution function. The inhomogeneity of an electric field in the plasma is shown to introduce fundamental changes in the physics of the particle motion. The periodic Larmor motion (gyration) is shifted in frequency and becomes elliptically polarized. The nonperiodic guiding-center drift obtains additional components, part of which are accelerated, causing the drift orbits to intersect the equipotential surfaces of a static electric field. Author (ESA)

N82-25991# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.
TEMPERATURE GRADIENT EFFECTS ON THE NEUTRAL GAS PENETRATION INTO A MAGNETIZED PLASMA Research and Training Program on Controlled Thermonuclear Fusion and Plasma Physics (EUR-NE)
M. Bures Jan. 1982 39 p refs
(TRITA-PFU-82-02; ISSN-0348-7644) Avail: NTIS HC A03/MF A01

Experimental evidence of temperature gradient effects on the neutral gas penetration into a plasma is summarized. An increased temperature gradient reduces the neutral gas content in the partially ionized boundary layer of a cold gas blanket system. A strong modification of the rotation plasma equilibrium is then observed. Such an equilibrium is a sensitive function of the neutral gas concentration both in the plasma in its boundary layers. The moderate values of the centrifugal force which act both on the ions and neutrals do not appreciably influence the plasma permeability to neutral gas. An acceleration of neutrals has to take place in a rotating plasma. Author (ESA)

N82-25992# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.

EQUILIBRIUM AND STABILITY OF A TOROIDAL SECTOR PLASMA DISCHARGE IN AN EXTRAP CONFIGURATION Research and Training Programme on Controlled Thermonuclear Fusion and Plasma Physics (EUR-NE)

J. R. Drake Feb. 1982 31 p refs Sponsored by Euratom (TRITA-PFU-82-03; ISSN-0348-7644) Avail: NTIS HC A03/MF A01

Discharge in a 60 deg section of a toroidal zeta pinch configuration, where the plasma current channel is positioned in the low field strength region of a linear octupole vacuum magnetic field, was studied. In the rest of the torus, the plasma current is conducted in a copper ring placed at the calculated equilibrium position in the low field region between the toroidal coils. Discharge occurs between electrodes. Good equilibrium is established, on the time scale of the discharge (30 msec), for plasma current amplitudes of 7 and 11 kA for a fixed main coil current of 24 kA turns. Discharge Alfven transit time = 0.5 msec. Author (ESA)

N82-25993# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.

DISCHARGE BREAKDOWN IN THE EXTRAP CONFIGURATION Research and Training Programme on Controlled Thermonuclear Fusion and Plasma Physics (EUR-NE)

J. R. Drake Feb. 1982 18 p refs Sponsored by Euratom (TRITA-PFU-82-04; ISSN-0348-7644) Avail: NTIS HC A02/MF A01

The discharge startup phase in a toroidal zeta pinch placed in the low field strength region of a linear octupole vacuum magnetic field is discussed. The breakdown differs from a usual Townsend breakdown because the B-field line is transverse to the electric field and is strongly inhomogeneous. The electric field is parallel to the axis of the configuration. This axis is also a line of zero B-field strength. Because of this zero line, the breakdown occurs in a channel of small radius centered on the axis. The plasma density builds up radially outward as the discharge current increases, until an equilibrium pressure profile is established. The plasma is ohmically heated. Author (ESA)

N82-25994# Paris-Sud Univ., Orsay (France). Lab. de Physique des Gaz et des Plasmas.

EXCITATION OF NITROGEN IN A LUMINOUS DISCHARGE [EXCITATION DE L'AZOTE DANS UNE DECHARGE LUMINESCENTE]

B. Massabieaux Feb. 1982 133 p refs In FRENCH (LP-193) Avail: NTIS HC A07/MF A01

Temporal relaxation of the excited states of molecular nitrogen, including ionized molecular states, was investigated. A continuous electric discharge in a positive plasma column was studied, using emission spectroscopy. A model of N2 energy levels in the discharge, based on kinetic theory, is presented. Experimental measurement of electron density, electric field, and gas temperature is described. Results from spectrum analysis of the positive second and negative first line systems give the spatial and vibrational distributions of the population of states. The equations that govern these states, when coupled with the Boltzmann equation, allow a non-Maxwellian solution to the electron energy distribution function. Author (ESA)

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N82-25995*# National Aeronautics and Space Administration. Pasadena Office, Calif.

CONTROLLED IN-SITU ETCHBACK Patent Application

Alan C. Seabaugh (JPL, California Inst. of Technology, Pasadena) and Robert J. Mattauch, inventors (to NASA) (JPL, California Inst. of Technology, Pasadena) Filed 30 Nov. 1981 16 p (Contract NAS7-100)

(NASA-Case-NPO-15625-1; US-Patent-Appl-SN-325933) Avail: NTIS HC A02/MF A01 CSCL 20L

A controlled in situ etch-back technique is in which an etch melt and a growth melt are first saturated by a source-seed crystal is described. Etchback of a substrate then takes plce by the slightly undersaturated etch melt. This is followed by liquid phase epitaxial growth melt, which is slightly supersaturated. J.D.

N82-25996# Pennsylvania Univ., Philadelphia. Office of Project Research and Grants.

MOLECULAR ORBITALS AND THE ATOMISTICS OF FRACTURE Interim Technical Report

M. E. Eberhardt, K. H. Johnson, R. P. Messmer, and C. L. Briant 10 Feb. 1982 27 p Submitted for publication Prepared in cooperation with MIT, Cambridge, and GE, Schenectady, N.Y. (Contract N00014-79-C-0991)

(AD-A111398; TR-11) Avail: NTIS HC A03/MF A01 CSCL 20/11

If a metal contains very few inpurities and is mechanically tested in an inert environment, its fracture mode will be either transgranular cleavage or transgranular ductile microvoid coalescence. If, however, the metal is of commercial purity, the brittle fracture mode can switch from cleavage to intergranular separation. This transition is undesirable because intergranular fracture is generally a very low energy process. The occurence of intergranular fracture in a specific situation will depend on a number of metallurgical variables: grain size, yield strength, test temperature, and notch radius. However, in all reported cases, one observation is common. Impurities which have a very low solubility in the bulk have segregated to the grain boundaries and weakened them. The bulk concentration of these impurities need only be several hundred ppm for grain boundary concentrations of 5-10 atomic percent to be observed. Examples of this impurity induced weakening of grain boundaries include sulfur in iron and nickel, phosphorus, tin, and antimony in steel, bismuth in copper, and oxygen in refractory metals. If the environment is not inert, intergranular separation may occur even though the fracture mode in an inert environment would be transgranular. One much studied example of this is hydrogen embrittlement. GRA

N82-25997# Maine Univ., Orono. Dept. of Physics and Astronomy.

PHASE DIAGRAM OF ISING MODELS WITH RANDOM SUBLATTICE VACANCIES

Chin-Kun Hu and Peter Kleban Feb. 1982 14 p refs Submitted for publication

(Contract N00014-79-C-0441; NR Proj. 392-032)

(AD-A111815; TR-7) Avail: NTIS HC A02/MF A01 CSCL 20/13

We use a modified Kadanoff's variational method to calculate the phase diagram of an Ising model with random vacancies on one of two interpenetrating sublattices of the isotropic square (SQ) and body-centered cubic (BCC) lattices. We find second order phase transitions only for $T>0$. The transition temperature to very good approximation decreases linearly with impurity (i.e., vacancy) concentration at small concentration. This agrees with the linear decrease observed in other systems. A plausible explanation of the absence of first order transitions for $T>0$ is given. The relation of our models to certain percolation problems is similar to that of some spin models studied by Syozi. Thus our results allow an estimate of critical probabilities for percolation. Author (GRA)

N82-25998# Maine Univ., Orono. Dept. of Physics and Astronomy.

DIRECT CALCULATION OF THE DERIVATIVES OF THE FREE ENERGY FOR ISING MODELS BY A MODIFIED KADANOFF'S VARIATIONAL METHOD

Chin-Kun Hu and Peter Kleban 17 Feb. 1982 41 p refs Submitted for publication

(Contract N00014-79-C-0441; NR Proj. 392-032)

(AD-A111816; TR-6) Avail: NTIS HC A03/MF A01 CSCL 20/13

We present a systematic procedure for the direct calculation of the free energy and its first and second derivatives for the Ising model in one to three dimensions with a wide class of symmetry properties. This renormalization group method is based on the modified Kadanoff's variational method (MKUM). This method is not only general but also very accurate numerically both near and far from the critical point. Further it includes correction to scaling effects not present in the standard linearized renormalization group treatment. This work describes the techniques and presents some illustrative results for the square lattice and body-centered cubic lattice with nearest neighbor interactions. A full treatment of our results will be given elsewhere. Author (GRA)

N82-25999# Yale Univ., New Haven, Conn. Section of Electrical Engineering.

RF PLASMA ANNEALING ON MOS STRUCTURES Final Report, 1 Feb. 1979 - 31 Jan. 1982

Maw-Rong Chin Dec. 1981 237 p refs

(Contract DAAG29-79-C-0021)

(AD-A110785; ARO-15835.6-EL) Avail: NTIS HC A11/MF A01 CSCL 20/12

Very Large Scale Integrated Circuits (VLSI) require advanced processing techniques to achieve the necessary pattern resolution. Some of these techniques, including E-beam or X-ray lithography, plasma or reactive ion etching (RIE), and ion implantation, use energetic particles or photons to overcome the resolution limitations associated with the more conventional processes. As a result, varying degree of radiation damage is frequently introduced in the Metal-SiO2-Si (MOS) device structure, which causes severe degradation of the circuit performance and reliability. Ever since the radiation effect was recognized as a potential problem for the development of VLSI technology, it has stimulated substantial research interest in many laboratories, in an effort to achieve sufficient level of scientific understanding, and to develop techniques that can best solve this problem. GRA

N82-26000# Colorado State Univ., Fort Collins.

CORRELATION BETWEEN THE COMPOSITION/BONDING AND INSULATING PROPERTIES OF GROWN OXIDES ON III-V COMPOUND SEMICONDUCTORS Final Report, 20 Sep. 1978 - 30 Sep. 1981

C. W. Wilmsen 6 Jan. 1982 9 p refs

(Contract DAAG29-80-C-0143; Grant DAAG29-78-G-0197)

(AD-A110743; Rept-1; ARO-15511.6-EL) Avail: NTIS HC A02/MF A01 CSCL 07/4

This research investigated the composition, structure and electrical properties of thermal and anodic oxides of the III-V compounds. The composition of the oxides was determined by XPS profiling. Models for the structure of the oxides were obtained from current-voltage, X-ray diffraction and XPS data. The chemical composition and electrical properties of anodic oxides of InP were found to be highly dependent on the growth conditions but the oxides on GaAs and InAs were not. GRA

N82-26001# Cornell Univ., Ithaca, N. Y. School of Electrical Engineering.

US FRANCE WORKSHOP ON GaAs MICROSTRUCTURES AND HIGH PERFORMANCE DEVICES Final Technical Report

L. F. Eastman Jan. 1982 9 p Workshop held at Boston, 8-10 Jun. 1981

(Contract N00014-81-G-0074; RR0210203; NR Proj. 243-038)

(AD-A110884; REPT-243-038-F) Avail: NTIS HC A02/MF A01 CSCL 20/12

The U.S./France Workshop on Gallium Arsenide Microstructures and High Performance Devices is discussed and the titles of scheduled papers and authors are presented. GRA

N82-26002# Cornell Univ., Ithaca, N. Y.

INVESTIGATION OF MOLECULAR BEAM EPITAXIAL GROWTH OF COMPOUND SEMICONDUCTORS AND CONTACTS FOR MICROWAVE DEVICES Final Report, 1 Nov. 1978 - 31 Oct. 1981

L. F. Eastman and C. E. C. Wood Jan. 1982 16 p refs

(Contract DAAG29-80-C-0069)

(AD-A110784; ARO-15479.16-EL) Avail: NTIS HC A02/MF A01 CSCL 20/7

MBE growth of non-alloyed ohmic contacts using a 250 A layer of N+ germanium between the N type GaAs and the metal has yielded specific contact resistances well below 1 x 10 to the -7th power ohms/sq cm. Various N type dopants in GaAs were investigated; Si proved to be the best for making ultra thin doped or undoped donor regions, with Ge being nearly as good, except for a small amount of surface segregation. Beryllium proved to be the best for making ultra thin acceptor regions, and it was used to make the first planar doped barriers, constructed at Ft. Monmouth. The physical electronics of Ga,InAs/InP, with A1, InAs electron confining layers, show promise for high frequency transistors. GRA

N82-26003# Michigan Technological Univ., Houghton. Dept. of Physics.

PROPERTIES OF THREE-DIMENSIONAL ENERGETIC SOLIDS AND MOLECULAR CRYSTALS Progress Report, 1 Jul. - 31 Dec. 1981

A. Barry Kunz, T. O. Woodruff (Michigan State Univ.), D. R. Beck (Michigan Technological Univ.), R. S. Weldman (Michigan Technological Univ.), and A. K. Ray (Michigan Technological Univ.) 1 Feb. 1982 7 p refs

(Contract N00014-81-K-0620)

(AD-A111081) Avail: NTIS HC A02/MF A01 CSCL 20/2

The ultimate goal is to provide a comprehensive atomistic level understanding of rapid combustion or explosion of solid phase energetic materials. This understanding is to include ultimately the question of initiation of the rapid oxidation, the sustaining of the rapid oxidation and its ultimate quenching. In addition atomistic factors related to stability, ageing and reliability are to be investigated. In order to facilitate this initial phase of the study prototype materials have been selected for study. These prototypes are CH4 and and NO. The initial process has been of two types. Specific results for the CH4 system and development of condensed matter physics techniques in ways optimally appropriate for molecular solids. The initial choice of CH4 was based upon two factors. The first and dominant factor is the availability of excellent data on the structure and electronic spectra of CH4 in both gas and condensed phases. The second factor is that both gas and condensed phases of CH4 have high symmetry of simple types. The initial studies on CH4 are attempts to characterize the ground and low lying excited states of CH4 in vacuum, bulk solid and at a solid surface. GRA

N82-26004# Cornell Univ., Ithaca, N. Y. School of Electrical Engineering.

MEASUREMENTS OF ELECTRICAL TRANSPORT PHENOMENA IN SEMICONDUCTOR MATERIALS Final Report

Jeffrey Frey Nov. 1981 268 p refs

(Contract AF-AFOSR-0131-79; AF Proj. 2301)

(AD-A111528; AFOSR-82-0015TR) Avail: NTIS HC A12/MF A01 CSCL 20/12

In the experiment, a microwave-modulated electron beam bombards a reverse-biased semi-transparent rectifying contact on the surface of a low-doped epitaxial layer, creating secondary carriers which traverse the layer and are collected at the conducting substrate. Analysis of the ensuing periodic microwave current yields the carrier velocity as a function of electric field. A general theory is presented from which expressions relating the carrier velocity as a function of depth to the amplitude and phase of each component of the test device terminal current are derived. The consequences of electric field nonuniformity in the sample are examined, and a method developed to correct for this effect. Diffusion effects are evaluated with a one dimensional numerical simulation of carrier motion through a test device, duplicating experimental conditions. All other

relevant secondary effects, including beam penetration depth, circuit effects, trapping, sample heating, impact ionization, and space-charge effects, are examined in the context of the present work. GRA

N82-26005# Hughes Research Labs., Malibu, Calif.
SILICON LIQUID CRYSTAL LIGHT VALVE FOR FLIGHT SIMULATION APPLICATIONS Final Report
U. Efron, J. Grinberg, P. G. Reif, and P. Braatz Brooks AFB, Tex. AFHRL Nov. 1981 118 p refs
(Contract F33615-79-C-0024; AF Proj. 2363)
(AD-A110928; AFHRL-TR-81-35) Avail: NTIS HC A06/MF A01 CSCL 20/2

The basic objective of this program has been to develop a silicon photoconductor liquid crystal light valve (Si LCLV) for application in wide-field-of-view simulators. The Si LCLV is expected to offer several advantages over the cadmium sulfide (CdS) photoconductor LCLV, including higher sensitivity, a significantly better switching ratio, higher resolution, and (most importantly) a fast response time to allow higher 60-Hz operation. The main thrust of this program was to upgrade the device in the following areas: (1) Scale up to a 2-inch aperture device (from a 1 cm x 1 cm active area). (2) Implement the silicon/silicon dioxide (Si/SiO2) dielectric mirror and improve the light blocking layer. (3) Upgrade device resolution by optimizing the focusing grid. (4) Increase the contrast ratio by improving silicon processing. (5) Implement the dc-biased guard ring to prevent edge breakdown. (6) Optimize liquid crystal operation to reduce the reponse time. Significant improvements were achieved in all areas. GRA

N82-26006# Copenhagen Univ. (Denmark).
SCATTERING OF ALIGNED ELECTRON BEAMS AT DISLOCATIONS: A SEMICLASSICAL ANALYSIS
A. E. Smith and L. T. Chadderton 1981 65 p refs
(KU-HCOE-FL2-R-81-01) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

The scattering of high energy electrons at dislocations in single crystals is discussed in a real space formalism, using semiclassical analytical methods, and the transition from quantum to classical mechanics is examined. The problem is first treated using a multislice method, with interest centering on the evaluation of the resulting defect overlap integrals describe the scattering between the various transverse states. An alternative approach, also developed, treats the problem by perturbation methods. This ultimately leads to an iterative solution. DOE

N82-26007# Central Research Inst. for Physics, Budapest (Hungary). Central Research Inst. for Physics.
POSITRON ANNIHILATION STUDY OF Fe/SUB 1-X)-B/SUB X) CRYSTALLINE BINARY SYSTEM
Khalid Al Ani, I. Dezsi, Zs. Kajcsos, A. Balogh, B. Molnar, and G. Brauer (Zentralinst. fuer Kernofrschung Rossendorf, Dresden) Jan. 1981 13 p refs In ENGLISH; HUNGARIAN summary (KFKI-1981-03; ISSN-0368-5330; ISBN-963-371-779-5) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The Fe/sub 1-x/-B/sub x/ system with x = 0, 0.025, 0.099, 0.150, 0.185, 0.307, 0.333, 0.500 and 1.00 was studied by measuring positron angular correlation and Doppler broadening of annihilation (BETA)-line energy. The dependence of the h parameter indicates a tendency for a preferred annihilation of positron at a B atomic site in the concentration range x < or = 0.333. The S parameter obtained from the energy distribution of the annihilation line gives the same conclusion as does the dependence of the h parameter. DOE

N82-26008# Central Research Inst. for Physics, Budapest (Hungary). Central Research Inst. for Physics.
THERMAL STABILITY AND CRYSTALLIZATION OF TRANSITION METAL-BORON METALLIC GLASSES
T. Kemeny, J. Balogh, L. Granasy, B. Fogarassy, E. Svab, I. Vincze, and F. Hajdu Oct. 1980 8 p refs In ENGLISH; HUNGARIAN summary Submitted for publication
(KFKI-1980-102; ISSN-0368-5330; ISBN-963-371-748-5) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The crystallization of (Fe sub(1-x)TM sub x sub (75+y) B sub (25-y) - TM = Co and Ni - glasses are investigated in the 0< x < 1, 0< y < 10 composites range by calorimetry, X-ray diffraction and Mossbauer spectroscopy. The crystalline phases are identified and their relation to possible changes in the chemical short range order of these amorphous alloys is discussed. DOE

N82-26009# Niels Bohr Inst., Copenhagen (Denmark).
CALCULATIONS IN THE WEAK AND CROSSOVER REGIONS OF SU(2) LATTICE GAUGE THEORY
J. Greensite, T. H. Hansson, N. D. HariDass, and P. G. Lauwers Jul. 1981 14 p refs Sponsored in part by Nordish Inst. for Teoretisk Atomfysik
(DE81-700143; NBI-HE-81-23) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A calculational scheme for lattice gauge theory is proposed which interpolates between lowest order mean field and full Monte Carlo calculations. The method is to integrate over a restricted set of link variables in the functional integral, with the remainder fixed at their mean field value. Small SU(2) Wilson loops near and above the weak to strong coupling transition point are computed. DOE

N82-26010# Atomic Energy Research Establishment, Harwell (England). Materials Physics Div.
SPACE GROUP OF THE LOW-TEMPERATURE PHASE OF SrTiO3
A. Okazaki (Kyushu Univ.) and B. T. M. Willis Aug. 1980 9 p refs
(MPD-NBS-161) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Evidence is presented (from a neutron diffraction study) that the space group of the low-temperature phase of strontium titanate is not 14/mcm, as believed previously. There are eight possible alternative space groups in the tetragonal system. DOE

N82-26011# International Atomic Energy Agency, Vienna (Austria).
ELECTRON-NUCLEAR DOUBLE RESONANCE IN SOLIDS: 1: NUCLEAR MOMENTS. 2: UNIAXIAL STRESS EFFECTS Final Report, 1 Dec. 1976 - 28 Feb. 1979
Carlos Fainstein (Centro Atomico Bariloche, Argentina) Jul. 1980 14 p refs
(IAEA-R-1887-F) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Ligand ENDOR spectroscopy was performed in fluorite type single cystals under uniaxial stress along the bonding axis with either Yb(3) or Tm(2) paramagnetic impurities. Following Baker and Fainstein (1975) the frequency shift of the ENDOR spectral lines is related to the change in ion ligand interaction with stress, the results thus obtained are compared with current models for an impurity ion in a lattice. DOE

N82-26012# Paris XI Univ., Orsay (France). Inst. de Physique Nucleaire.
STRUCTURAL AND ELECTRONIC PROPERTIES OF ION-IMPLANTED SUPERCONDUCTORS
Harry Bernas and Pierre Nedellec 1980 65 p refs Presented at the Intern. Conf. on Ion Beam Modification of Mater., Albany, N.Y., 11-15 Jul. 1980 Submitted for publication
(IPNO-PhN-80-27) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

Ion implanted superconductors are discussed. In situ X-ray, channeling, resistivity, and electron tunneling experiments approach the relation between lattice order (or disorder) and superconductivity. DOE

N82-26013# Science Research Council, Chilton (England).
LOW-TEMPERATURE THEORIES OF THE CLASSICAL ONE-DIMENSIONAL EASY-PLANE FERROMAGNET: SUCCESSES AND LIMITATIONS
J. M. Loveluck, T. Schneider, E. Stoll, and J. R. Jauslin 1981 23 p refs Prepared in cooperation with IBM Research Lab., Zurich
(PB82-131665; RL-81-072) Copyright. Avail: NTIS HC A02/MF A01 CSCL 20L

Computer simulation results for the dynamic-structure factors of a ferromagnetically-coupled, classical one dimensional easy-plane spin system are compared with calculations based

on a linear spin-wave theory, for the case where a magnetic field is applied in the easy plane. The case of zero applied field is also considered, and here the results are compared with the low-temperature theory of Cieplak and Sjolander. GRA

N82-26014# Science Research Council, Chilton (England).
SPIN-WAVE DAMPING IN THE QUANTUM ISING-HEISENBERG CHAIN
S. W. Lovesey 1981 9 p
(PB82-134149; RL-81-073) Copyright. Avail: NTIS HC A02/MF A01 CSCL 20L

Spin-wave interactions in an anisotropic Heisenberg magnet, subject to an external field, are studied in terms of the corresponding Dyson-Maleev boson Hamiltonian. The self-energy for transverse spin fluctuations is calculated completely in the limit of low temperatures, and the spin-wave damping and shift are obtained in analytic form for all wavevectors for a one dimensional system. GRA

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

N82-26015# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
HEAT CAPACITY OF WATER AT EXTREMES OF SUPERCOOLING AND SUPERHEATING
C. A. Angell, W. J. Sichina, and M. Oguni Dec. 1981 25 p refs
(Contract N00014-78-C-0035; Grant NSF DMR-77-04318)
(AD-A111394) Avail: NTIS HC A02/MF A01 CSCL 20/13

Low temperature heat capacities for water and deuterium oxide have been remeasured using different sample preparation and data analysis procedures from those used in the original studies of this anomalous region. Self-consistent results have been obtained with reproducibilities of 1%. Comparisons are made with the behavior in the superheated region at 1 atm pressure calculated from a refined equation of state by Haar, et al. It appears that the kinetic metastability limit of the liquid (nucleation terminated) at both hot and cold extremes may be reached at the same value of the liquid heat capacity. GRA

N82-26016# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
ANOMALOUS COMPONENTS OF SUPERCOOLED WATER EXPANSIVITY, COMPRESSIBILITY AND HEAT CAPACITY (C SUB P AND C SUB V) FROM BINARY FORMAMIDE + WATER SOLUTION STUDIES
M. Oguni and C. A. Angell Jan. 1982 36 p refs
(Contract N00014-78-C-0035)
(AD-A111339) Avail: NTIS HC A03/MF A01 CSCL 20/13

Following earlier use of binary solution studies to estimate anomalous and normal components of the total heat capacity of supercooled water, we have extended this type of study to the system water + formamide, and included the additional properties expansivity and compressibility. The excess, or anomalous, expansivities and heat capacities of pure water assessed from this study fit critical point equations with singular temperatures close to those assessed in earlier studies. The compressibility, however, yields a 'normal' component which is large compared with that estimated from ethanol-water solutions and leads to very poor fits to critical point equations. The source of this discrepancy is discussed. Combining all results, we have obtained a plot of C(v) for binary solutions at different temperatures, and thereby have estimated an anomalous component for the constant volume heat capacity. In contrast to the constant pressure heat capacity, which diverges, the constant volume anomalous component behaves like a Schottky anomaly. In this respect an analogy with the adiabatic compressibility may be noted. Author (GRA)

N82-26017# Wisconsin Univ. - Madison. Mathematics Research Center.
DYNAMIC PHASE TRANSITIONS IN A VAN DER WAALS FLUID
M. Slemrod Nov. 1981 38 p refs
(Contract DAAG29-80-C-0041; Grants AF-AFOSR-0172-81; NSF MCS-79-02773)
(AD-A110455; MRC-TSR-2298) Avail: NTIS HC A03/MF A01 CSCL 07/4

This paper proves the existence of traveling wave solutions connecting liquid and vapor phases in a van der Waals fluid. The main constitutive assumptions are that the fluid be an elastic fluid(with pressure given by the van der Waals equation of state) possessing a higher order correction given by Korteweg's theory of capillarity and the fluid is a conductor of heat with large specific heat at constant volume. The main mathematical tool in the analysis is the Conley-Easton theory of isolating blocks. Author (GRA)

N82-26018# Central Research Inst. for Physics, Budapest (Hungary). Central Research Inst. for Physics.
EINSTEIN'S THEORY RECOVERED
A. Sebestyen Nov. 1980 20 p refs In ENGLISH; HUNGARIAN summary Submitted for publication
(KFKI-1980-113; ISSN-0368-5330; ISBN-963-371-721-3)
Avail: NTIS HC A02/MF A01

It is shown that a consequent treatment of local Lorentz invariance and of the group of translations as a gauge symmetry group necessarily leads to theories in which torsion has no place. It is also shown that the requirement of symmetry under Lorentz gauge transformations leads to the emergence of the conventional (INTEGRAL)-gR additive term, responsible for the effects of gravitation, in the Lagrangian. It is thus proved that Einstein's general relativity is a unique consequence of the requirements of invariance under translations and Lorentz transformations. DOE

N82-26019# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
LINEAR QUASIPOTENTIAL IN THE FRAMEWORK OF QUANTUM FIELD THEORY
G. A. Kozlov, S. P. Kuleshov, and R. P. Zaikov 1980 4 p refs Submitted for publication
(JINR-E-2-80-352) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The Loginov-Tavkhelidze quasipotential equation for the two-particle wave function in two-dimensional space-time is considered. It is shown that the phenomenological potential V(r) = ar can be derived in the framework of quantum field theory if the exchanging field satisfies the fourth-order equation. DOE

N82-26020# Niels Bohr Inst., Copenhagen (Denmark).
VACUUM IN MULTICOLOR QCD
P. Olesen Nov. 1980 25 p refs
(NBI-HE-80-50) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

It is assumed that among asymptotic solutions to the Makeenko-Migdal equation of the form exp(-aA - bL) (A = area, L = perimeter, A and L are large) there is also the solution which has asymptotic freedom at small distances. It is then shown that vacuum is filled with magnetic vortex lines with nontrivial topology. The vacuum energy was calculated, and it is found that it is exponentially small for large volumes. The Higgs phase is then ruled out, b = 0. The result for the vacuum energy agrees well with an expression obtained by 't Hooft from duality. DOE

N82-26021# Niels Bohr Inst., Copenhagen (Denmark).
EIGENVALUES OF THE WILSON OPERATOR IN MULTICOLOR QCD
B. Durhuus and P. Olesen Nov. 1980 41 p refs Prepared in cooperation with Nordisk Inst. for Teoretisk Atomfysik
(NBI-HE-80-47) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

For continuum QCD with N = infinity the authors consider the spectral density rho/sub C/((-)) of the eigenvalues (-) for the Wilson operator defined on the curve C. It is shown that as a consequence of the Makeenko-Migdal equation rho/sub C/((-))

satisfies a non-linear differential-integral-equation. The equation for rho/sub C/((-)) is closely related to the condition for the occurrence of a saddle point in the functional integral when N = infinity. This interpretation is remarkably analogous to a result obtained by Gross and Witten for the two dimensional Wilson lattice theory, although the equation satisfied by rho/sub C/((-)) is much more complicated in the continuum theory. DOE

N82-26022# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Moscow (USSR). Inst. of Theoretical and Experimental Physics.

OPERATOR EXPANSION IN QUANTUM CHROMODYNAMICS BEYOND PERTURBATION THEORY

V. A. Novikov, M. A. Shifman, A. I. Vainshtain, and V. I. Zakharov 1980 35 p refs

(ITEP-27(1980)) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The status of operator expansion at short distances is discussed within the frameworks of nonperturbation QCD. The question of instant on effects is investigated in various aspects. Two point functions induced by the gluonic currents are considered. It is shown that certain gluonic correlations vanish in the field of definite duality. It is proved that there does exist a very special relation between the expansion coefficients required by consistency between instanton calculations and the general operator expansion. At last a certain modification of the naive version of operator expansion is proposed, which allows one to go beyond the critical power and construct, if necessary, an infinite series. DOE

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N82-26023# SRI International Corp., Menlo Park, Calif. Artificial Intelligence Center.

PARALLELISM IN PLANNING AND PROBLEM SOLVING: REASONING ABOUT RESOURCES

David E. Wilkins 5 Jan. 1982 17 p refs

(Contract F49620-79-C-0188; AF Proj. 2304)

(AD-A111933; TR-258; AFOSR-82-0089TR) Avail: NTIS HC A02/MF A01 CSCL 05/1

The implications of allowing parallel actions in a plan or problem solution are discussed. The planning system should take advantage of helpful interactions between parallel branches, must detect harmful interactions, and, if possible, remedy them. This paper describes what is involved in this and presents some new techniques that are implemented in an actual planning system and are useful in seeking solutions to these problems. The most important of these techniques, reasoning about resources, is emphasized and explained. Author (GRA)

N82-26024# Duke Univ., Durham, N. C. Graduate School of Business Administration.

MULTIATTRIBUTE RISKY CHOICE BEHAVIOR: THE EDITING OF COMPLEX PROSPECTS

John W. Payne, Dan J. Laughhunn, and Roy Crum Feb. 1982 40 p refs

(Contract N00014-80-C-0114; NR Proj. 197-063)

(AD-A111656; ONR-82-2) Avail: NTIS HC A03/MF A01 CSCL 05/10

This investigation draws upon concepts from prospect theory and multiattribute utility theory in an examination of the multiattribute risky choice behavior of 128 managers. The question of how managers code multiattribute prospects, and how coding relates to various independence assumptions, was explored. Results indicate that managers violate attribute independence in its general form, and in the form of the marginality assumption. The most common form of behavior was multiattribute risk aversion for prospects involving only gains and multiattribute risk seeking for prospects involving only losses. This result reinforces the importance of a target, reference point, or aspiration level that has been found in studies of single attribute risky choice. Furthermore, the result casts doubt on such commonly used multiattribute utility functions as the additive, multiplicative, and multilinear forms. Event independence, necessary for expectation models and a consequence of the cancellation of common components of prospects, was found to hold when the common values and probabilities were relatively small. When the common event had relatively large values and probabilities, there was some evidence that such events may influence choice. GRA

N82-26025# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.

AN INVESTIGATION OF TIME SERIES GROWTH CURVES AS A PREDICTOR OF DIMINISHING MANUFACTURING SOURCES OF ELECTRONIC COMPONENTS M.S. Thesis

Michael E. Brooks Sep. 1981 121 p refs

(AD-A111375; AFIT-LSSR-98-81) Avail: NTIS HC A06/MF A01 CSCL 15/5

A method for forecasting diminishing manufacturing sources (DMS), or the situation occurring when the last manufacturing source discontinues or intends to discontinue production of items required to logistically support weapon systems is presented. A technology's life cycle curve is re-expressed as a specialized time series growth curve known as the s-curve. Unit sales and dollar volume of sales were the two types of annual aggregate commercial sales data used to examine the growth curves of three families of obsolete electronic components. The component types were germanium transistors, germanium diodes/rectifiers, and receiving tubes. It is hypothesized that a standard nonlinear growth curve model could be fitted to each set of obseved data using least squares nonlinear regression. The Pearl function appeared to offer the best mathematical explanation of the underlying economic nature of each time series growth curve in addition to providing the best overall data fit. Growth curve analysis indicated that DMS occurred at or near the saturation level of each curve; however, DMS did not occur at the same point on each curve. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N82-26026# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

MINUTES OF THE FIRST SEMINAR ON USE OF THE NATIONAL SYSTEM FOR COLLECTION OF SATELLITE DATA [1ST SEMINARIO DE USUARIOS DO SISTEMA NACIONAL DE COLETA DE DODOS POR SATELITES]

Jul. 1981 253 p refs In PORTUGUESE Seminar held at Sao Jose Dos Campos, Brazil, 28-30 May 1980

(INPE-2168-RPE/384) Avail: NTIS HC A12/MF A01

The activities and plans of the Brazilian system for collection of hydrological and meteorological data are described. For individual titles, see N82-26027 through N82-26040.

N82-26027# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

SMS/GOES DATA COLLECTION PLATFORM SYSTEM [PLATFORMA DE COLETA DE DADOS SISTEMA SMS/GOES]

Valter Rodrigues *In its* Minutes of the 1st Seminar on Use of the Natl. System for Collection of Satellite Data Jul. 1981

p 21-30 In PORTUGUESE (For primary document see N82-26026 16-82)
Avail: NTIS HC A12/MF A01

The SMS/GOES synchronous meteorological satellite system, consisting of the satellite, ground stations, and data collection platforms, is described. The objectives of the system and the services it performs are listed. Applications of the data collection platforms are surveyed and the platforms described. The parameters of the data collected are listed. Transl. by J.D.

N82-26028# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
DATA TRANSMISSION [TRASMISSAO DE DADOS]
Juan Carlos Pinto deGarrido *In its* Minutes of the 1st Seminar on Use of the Natl. System for Collection of Satellite Data Jul. 1981 p 33-45 In PORTUGUESE (For primary document see N82-26026 16-82)
Avail: NTIS HC A12/MF A01

The method of transmission of data from the network of data collection platforms to users is described. Data compression, coding, and data retrieval methods are summarized. A summary of the cost of the transmission lines is presented. Methods of communication between users and the information dissemination center are described and the procedures for telephonic and telex communication between user and the information center are described. Transl. by J.D.

N82-26029# Foundation for the Technical Development of Engineering, Sao Paulo (Brazil).
A TELEMETRY SYSTEM FOR ACQUISITION AND RECORDING OF DATA: STAR [UM SISTEMA TELEMETRICO DE AQUISICAO E REGISTRO DE DADOS: STAR]
Paul Jean Etienne Jeszensky *In* Instituto de Pesquisas Espaciais 1st Seminar on Use of the Natl. System for Collection of Satellite Data Jul. 1981 p 49-62 In PORTUGUESE (For primary document see N82-26026 16-82)
Avail: NTIS HC A12/MF A01

Operation of the STAR telemetric data acquisition and recording system is described. The information flow through the network, the form of the messages, and the coding are described. A functional description of the elements of the network, including the ground station, is presented. Transl. by J.D.

N82-26030# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SUMMARY OF THE INPE SATELLITE PROGRAM [RESUMO DO PROGRAMA DE SATELITES DO INPE]
Rege Romeu Scarabucci *In its* 1st Seminar on Use of the Natl. System for Collection of Satellite Data Jul. 1981 p 65-94 In PORTUGUESE (For primary document see N82-26026 16-82)
Avail: NTIS HC A12/MF A01

An overall survey of the Brazilian space program and space mission is presented. A nine year plan for development and launching of the first and second Brazilian satellites is presented. The satellites and their onboard subsystems are described. The mission of the first satellite is retransmission to Earth of data from an offshore and a terrestrial data collection platform, each located in Brazilian territory. The planned mission of the second satellite is remote sensing of mineral resources. The location and capabilities of the ground stations are described, and the respective responsibilities of INPE (Instituto de Pesquisas Espaciais) and IAE (Instituto de Ativadades Espaciais) are outlined. Transl. by J.D.

N82-26031# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
DATA COLLECTION SYSTEM OF THE FIRST BRAZILIAN SATELLITE [SISTEMA DE COLETA DE DADOS DO PRIMEIRO SATELITE BRASILEIRO]
Jose Roberto deOliveira *In its* 1st Seminar on Use of the Natl. System for Collection of Satellite Data Jul. 1981 p 97-116 In PORTUGUESE (For primary document see N82-26026 16-82)
Avail: NTIS HC A12/MF A01

The system, its components, and the data reduction and data dissemination procedures are described. The problem of random access is considered. The characteristics of the system, particularly the transponder and the message capacity of the system, are described. The specifications of the ground based data collection platforms, including frequency selection, are presented. Transl. by J.D.

N82-26032# Brazilian Central Electric, Rio de Janeiro. Dept. de Geracao da Diretoria de Planejamento e Engenharia.
TELEMETRY OF HYDROMETEOROLOGICAL DATA USEFUL FOR THE ELECTRICAL INDUSTRY [TELEMETRIA DE DADOS HIDROMETEOROLOGICOS UTILIZACAO PELO SETOR ELETRICO]
Sergio Barbosa deAlmeida *In* Instituto de Pesquisas Espaciais 1st Seminar on Use of the Natl. System for Collection of Satellite Data Jul. 1981 p 119-127 refs In PORTUGUESE (For primary document see N82-26026 16-82)
Avail: NTIS HC A12/MF A01

Ground based networks for collection of hydrometeorological data are described. Maps of the stations in the Tres Marias, Rio Grande, and Tocantins river basins for measurement of precipitation and river level are presented. The purposes of each data acquisition network; for flood control, power generation, water supply, reservoir operation, or industrial development, are outlined. The findings of an electric utility study group investigating the usefulness of this information for the electric power industry are summarized. Transl. by J.D.

N82-26033# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
DIGITAL CASSETTE RECORDER [GRAVADOR CASSETE DIGITAL]
Marcos Antonio Rodriques *In its* 1st Seminar on Use of the Natl. System for Collection of Satellite Data Jul. 1981 p 131-147 In PORTUGUESE (For primary document see N82-26026 16-82)
Avail: NTIS HC A12/MF A01

The integration of an automatic tape recorder into the data acquisition and conversion system of a data collection platform is described. Flow diagrams of the entire system are presented, and detailed instructions for the installation and operation of the tape recorder are given. Transl. by J.D.

N82-26034# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PROGRAMMABLE DATA COLLECTION PLATFORMS - PPCDs [PLATAFORMAS PROGRAMAVEIS DE COLETA DE DADOS - PPCDS]
Eduardo Whitaker Bergamini and Jose Bianchi Neto *In its* 1st Seminar on Use of the Natl. System for Collection of Satellite Jul. 1981 p 151-158 In PORTUGUESE (For primary document see N82-26026 16-82)
Avail: NTIS HC A12/MF A01

The use of programmable data collection platforms (PPCD) is described. Applications of PPCDs to preprocessing of data, provision of operational flexibility, failure detection, message transmission and/or reception, remote operation of a platform, and numerical control and exchange of subsystems are considered. An example of the use of a PPCD for collection of environmental data is presented. Programmable platforms being designed by INPE are summarized. Transl. by J.D.

N82-26035# National Dept. of Water and Electrical Energy, Brasilia (Brazil). Ministerio das Minas e Energia.
NATIONAL SYSTEM FOR HYDROMETEOROLOGICAL INFORMATION [SISTEMA DE INFORMACOES IN HIDROMETEOROLOGICAS NACIONAL]
Paulo Roberto Martins Garcia *In* Instituto de Pesquisas Espaciais 1st Seminar on Use of the Natl. System for Collection of Satellite Data Jul. 1981 p 161-177 In PORTUGUESE (For primary document see N82-26026 16-82)
Avail: NTIS HC A12/MF A01

The development and operation of the Brazilian system for hydrometeorological information (SIH) are described. A detailed description of the operation of specific subsystems for inventory of hydrometeorological stations, daily data collection, monthly and annual data summations, water quality, and for the assessment of water rights, water usage, industrial water pollution, and existing hydroelectric plants is presented. The computer programs used by the SIH are listed and described. Transl. by J.D.

N82-26036# Sao Paulo Univ. (Brazil). Escola de Engenharia.
COLLECTION OF HYDROLOGICAL DATA BY TELEMETRY

[COLETA DE DADOS HIDROLOGICOS POR TELEMETRIA]
Hans George Arens and Woodrow Nelson Lopes Roma *In* Instituto de Pesquisas Espaciais 1st Seminar on Use of the Natl. System for Collection of Satellite Data Jul. 1981 p 181-187 In PORTUGUESE (For primary document see N82-26026 16-82)
Avail: NTIS HC A12/MF A01

The telemetric collection of hydrological data is described. This method of data collection eliminates the need for reliance on unqualified operators and automatic data registration in computer compatible form provides rapid access to accurate information. The operation of a telemetric data acquisition and transmission system developed for data collection from eight hydrological stations in a rural river basin is described.
Transl. by J.D.

N82-26037# European Space Agency, Toulouse (France). METEOSAT Data Management Dept.
THE METEOSAT DATA COLLECTION SYSTEM AND ITS APPLICATION
A. Robson and H. Hovet *In* Instituto de Pesquisas Espaciais 1st Seminar on Use of the Natl. System for Collection of Satellite Data Jul. 1981 p 191-206 (For primary document see N82-26026 16-82)
Avail: NTIS HC A12/MF A01

The METEOSAT data collection system and its applications are described. Use of the system for collection of meteorological data at remote land sites in Greenland, for meteorological and sea state monitoring at offshore sites in the North and Baltic Seas, for hydrological monitoring in Great Britain, and for meteorological data collection from aircraft is discussed. J.D.

N82-26038# National Inst. of Meteorology, Brasilia (Brazil). Ministerio da Agricultura.
SYSTEM OF DATA COLLECTION PLATFORMS. INEMET PROGRAMS [SISTEMA DE PLATAFORMAS DE COLETA DE DADOS PROGRAMAS DO INEMET]
Jose Arimateia deSouza Brito *In* Instituto de Pesquisas Espaciais 1st Seminar on Use of the Natl. System for Collection of Satellite Data Jul. 1981 p 209-222 In PORTUGUESE (For primary document see N82-26026 16-82)
Avail: NTIS HC A12/MF A01

Plans for the development of a system of ground based platforms in remote regions of Brazil for the collection of hydrometeorological data are described. The SMS/GOES satellite data acquisition and transmission system is described and the integration of Brazilian ground stations into the system is considered. Plans for implementation of the Brazilian, the characteristics of the data collection platforms, and a summary of the political considerations involved are presented.
Transl. by J.D.

N82-26039# Superintendancy of the Development of the Amazon Region, Recife (Brazil).
TELEMETRY IN THE AMAZONIAN REGION HYDROLOGY AND CLIMATOLOGY PROJECT [A TELEMETRIA NO PROJETO DE HIDROLOGIA E CLIMATOLOGIA DA AMAZONIA]
Evaristo Terezo and Carlos Osorio *In* Instituto de Pesquisas Espaciais 1st Seminar on Use of the Natl. System for Collection of Satellite Data Jul. 1981 p 225-235 In PORTUGUESE Prepared in cooperation with the Amazonian Region Hydrology and Climatology Project (For primary document see N82-26026 16-82)
Avail: NTIS HC A12/MF A01

The use of telemetry in the collection and transmission of hydrological and hydrometeorological data in the Amazon River basin is discussed. The collection of basic hydrological data and its application to the determination of the form of the river, the form and characteristics of its hydrographic basin, and the provision of data for hydrology models are described. An evaluation of the telemetry systems considered, a description of the GOES system chosen, and a plan for the implementation of the system are presented.
Transl. by J.D.

N82-26040# National Dept. of Works and Health, Rio de Janeiro (Brazil).
NETWORK OF TELEMETRY STATIONS IN THE BASIN OF THE UPPER PARAGUAY RIVER IN MATO GROSSO STATE [REDE DE ESTACOES TELEMETRICAS NA BACIA DO ALTO RIO PARAGUAI ESTADO DO MATO GROSSO]
Newton deOliveira Carvalho and Humberto Castello Branco deOliveira, Jr. *In* Instituto de Pesquisas Espaciais 1st Seminar on Use of the Natl. System for Collection of Satellite Data Jul. 1981 p 237-247 In PORTUGUESE (For primary document see N82-26026 16-82)
Avail: NTIS HC A12/MF A01

A network of telemetry stations for flood prediction is described. The characteristics of the Brazilian part of the upper Paraguay River from the mouth of the Apa River north, and of the Pantanal region through which the river flows are surveyed. An existing data collection network was expanded by the addition of automatic data collection stations and a mathematical model of the hydrology of the river basin prepared. The equipment and the functioning of the field stations and the base station are described.
Transl. by J.D.

N82-26041# Naval Ship Research and Development Center, Bethesda, Md. Computation, Mathematics and Logistics Dept.
QUANTIFICATION OF EFFECTIVENESS Final Report, Apr. 1980 - Apr. 1981
Paul Hubai Jan 1982 35 p refs
(WF60532000)
(AD-A111475; DTNSRDC/CMLD-82/01) Avail: NTIS HC A03/MF A01 CSCL 05/1

The Quantification of Effectiveness (QUEF) program was initiated to develop a simplified method of measuring systems effectiveness and to determine the sensitivity of systems effectiveness to logistic factors. The initial approach was to quantify systems effectiveness from the equipments' mission essential hardware characteristics. This approach was discontinued because the hardware characteristics identified were too detailed to allow a general method to be developed. The second approach involved the identification of the logistics factors that influence systems effectiveness and the reallocation of resources among the most sensitive of the logistics factors. This report describes the methodologies employed in the two approaches, discusses the problem, and presents the results.
Author (GRA)

N82-26042# Yale Univ., New Haven, Conn. Dept. of Computer Science.
SACRIFICING SERIALIZABILITY TO ATTAIN HIGH AVAILABILITY OF DATA IN AN UNRELIABLE NETWORK
Michael J. Fischer and Alan Michael (Wisconsin Univ., Madison) Feb. 1982 11 p refs Prepared in cooperation with Washington Univ., Seattle
(Contract N00014-80-C-0221; Grants NSF MCS-80-03337; NSF MCS-80-04111; NSF MCS-81-16678; NR Proj. 049-456) (AD-A111261; RR-221) Avail: NTIS HC A02/MF A01 CSCL 09/2

We present a simple algorithm for maintaining a replicated distributed dictionary which achieves high availability of data, rapid processing of atomic actions, efficient utilization of storage, and tolerance to node or network failures including lost or duplicated messages. It does not require transaction logs, synchronized clocks, or other complicated mechanisms for its operation. It achieves consistency contraints which are considerably weaker than serial consistency but nonetheless are adequate for many dictionary applications such as electronic appointment calendars and mail systems.
Author (GRA)

N82-26043# Battelle Columbus Labs., Ohio.
MECHANICAL PROPERTIES DATA CENTER Annual Report, 1 Jan. - 31 Dec. 1981
Harold Mindlin, Harold Hucek, and Ross Gubiotti Feb. 1982 40 p
(Contract DLA900-79-C-0539)
(AD-A111693; AMMRC-TR-82-9) Avail: NTIS HC A03/MF A01 CSCL 05/2

This report summarizes MPDC activities for the period 1 January 1981 through 31 December 1981, a total of 12 months, under Contract DLA900-79-C-0539. It provides a summary of the scope, objectives, and organization of MPDC, its information processing products, and services, and a discussion of management objectives. The report focuses on the accomplishments and operation of the mechanical properties numeric

database and the continuation of the products and services of the Center. J.D.

N82-26044# Societe Nationale Industrielle Aerospatiale, Toulouse (France). Direction Etudes.
DISPLAY, HANDLING, AND STORAGE OF DATA BY THE SIGMA SYSTEM [REPRESENTATION, MANIPULATION, STOCKAGE DE DONNEES DANS LE SYSTEME SIGMA]
J. P. Barde (CERT) 7 Jan. 1982 33 p In FRENCH Presented at Conf. on Bases de Donnees en C.A.O., Garin, France, Mar. 1981
(SNIAS-821-111-162) Avail: NTIS HC A03/MF A01

A scientific data bank, oriented towards computer assisted design of aircraft, is presented. Software constraints on a data management program are reviewed. The hierarchical data access structure is depicted. Raw data is distributed among domains that correspond to technologies or tasks. The system is user friendly, but requires an editing routine for updating. The SIGMA system is a library of application programs which include problem specific subroutines. Three examples of subroutines are explained. Utilization of SIGMA for the design of aircraft parts, their geometry, and definition of surfaces for numerically controlled machining, is described. Author (ESA)

N82-26045# Technische Universitaet, Munich (West Germany). Inst. fuer Luft- und Raumfahrt
USE OF SPACE FLIGHT BY UNIVERSITIES
Eduard Igenbergs Bonn Bundesministerium fuer Forschung und Technologie Jul. 1981 78 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
Avail: NTIS HC A05/MF A01

Spaceborne experiments, planned and designed at the university level, are discussed. Small self-contained payloads of simple configuration that pose minimal space flight requirements are considered for inclusion in Spacelab, the Long Duration Exposure Facility, and for the Getaway Special (NASA). Astronautics technical support of university projects and information flow are treated. A university operated information dissemination system is proposed in order to strengthen contact with astronautical institutes. Information exchange procedures are demonstrated for three experimental designs. Author (ESA)

N82-25178# Air Navigation Services, Inc., Westerngrund (West Germany). Advisory Group.
AERONAUTICAL INFORMATION DATA SUBSYSTEMS
Frank W. Fischer *In* DFVLR Proc. of the 11th Symp. on Aircraft Integrated Data Systems Nov. 1981 p 159-184 refs (For primary document see N82-25171 16-01)
Avail: NTIS HC A20/MF A01; DFVLR, Cologne DM 122.90

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

N82-26046# Committee on Science and Technology (U. S. House).
FORECASTING NEEDS FOR THE HIGH TECHNOLOGY INDUSTRY
Washington GPO 1982 265 p refs Hearings before the Subcomm. on Sci., Res. and Technol. of the Comm. on Sci. and Technol., 97th Congr., 1st Sess., No. 67, 24 Nov. 1981
(GPO-89-542) Avail: Subcommittee on Science, Research and Technology

Innovation and productivity in high technology industries are discussed. Issues considered include (1) the shortage of engineers, computer scientists, solid state physicists, chemists, computer programmers, systems analysts, drafters and other computer specialists; (2) foreign competition; and (3) the capital needs of the high technology industry. N.W.

N82-26047*# Martin Marietta Corp., Denver, Colo. Aerospace Div.
TRACK TRAIN DYNAMICS ANALYSIS AND TEST PROGRAM: METHODOLOGY DEVELOPMENT FOR THE DERAILMENT SAFETY ANALYSIS OF SIX-AXLE LOCOMOTIVES
P. P. Marcotte (Dynamics Sciences Ltd.) and K. J. R. Mathewson (Dynamics Sciences Ltd.) May 1982 161 p refs
(Contract NAS8-29882)
(NASA-CR-162026; NAS 1.26:162026; MCR-81-560(Rev 1))
Avail: NTIS HC A08/MF A01 CSCL 13F

The operational safety of six axle locomotives is analyzed. A locomotive model with corresponding data on suspension characteristics, a method of track defect characterization, and a method of characterizing operational safety are used. A user oriented software package was developed as part of the methodology and was used to study the effect (on operational safety) of various locomotive parameters and operational conditions such as speed, tractive effort, and track curvature. The operational safety of three different locomotive designs was investigated. S.L.

N82-26048*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
VEHICLE TEST REPORT: JET INDUSTRIES ELECTRA VAN 600
Theodore W. Price and Vincent A. Wirth, Jr. 15 Feb. 1982 50 p refs
(Contracts NAS7-100; DE-AI01-78CS-54209)
(NASA-CR-168986; JPL-Pub-82-36; NAS 1.26:168986; DOE/CS-54209/9) Avail: NTIS HC A03/MF A01 CSCL 13F

The Electra Van 600, an electric vehicle, was tested. Tests were performed to characterize parameters of the Electra Van 600 and to provide baseline data to be used for comparison of improved batteries and to which will be incorporated into the vehicle. The vehicle tests concentrated on the electrical drive subsystem, the batteries, controller, and motor; coastdowns to characterize the road load and range evaluation for cyclic and constant speed conditions; and qualitative performance was evaluated. It is found that the Electra Van 600 range performance is approximately equal to the majority of the vehicles tested previously. E.A.K.

N82-26049*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ENVIRONMENTAL CONTROL SUBSYSTEMS FOR ELECTRIC AND HYBRID VEHICLES
Burton Zeldin 15 Apr. 1982 42 p refs
(Contracts NAS7-100; DE-AI01-78CS-54209)
(NASA-CR-168982; JPL-Pub-82-17; NAS 1.26:168982;

DOE/CS-54209/7) Avail: NTIS HC A03/MF A01 CSCL 13F

Environmental control subsystems for electric and hybrid vehicles are studied. The split absorption heat pump/refrigerator environmental control subsystem is recommended for further development. S.L.

N82-26050*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

FUTURE FUELS AND ENGINES FOR RAILROAD LOCOMOTIVES. VOLUME 2: TECHNICAL DOCUMENT

S. G. Liddle 1 Nov. 1981 392 p refs

(Contracts NAS7-100; DE-AI01-78CS-55151; EM-78-1-01-5151)

(NASA-CR-168983; JPL-Pub-81-101; NAS 1.26:168983) Avail: NTIS HC A17/MF A01 CSCL 13F

The potential for reducing the dependence of railroads on petroleum fuel, particularly Diesel No. 2 was studied. The study takes two approaches: to determine the use of Diesel No. 2 can be reduced through increased efficiency and conservation, and to use fuels other than Diesel No. 2 both in Diesel and other types of engines. Synthetic hydrocarbon fuels, probably derived from oil shale, will be needed if present diesel-electric locomotives continue to be used. S.L.

N82-26051*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PRELIMINARY ANALYSIS OF A DOWNSIZED ADVANCED GAS-TURBINE ENGINE IN A SUBCOMPACT CAR

John L. Klann and Roy L. Johnsen 1982 25 p refs Presented at the 18th Joint Propulsion Conf., Cleveland, 21-23 Jun. 1982

(Contract DE-AI01-77CS-51040)

(NASA-TM-82848; E-1218; NAS 1.15:82848; DOE/NASA/51040-40) Avail: NTIS HC A02/MF A01 CSCL 13F

Relative fuel economy advantages exist for a ceramic turbine engine when it is downsized for a small car were investigated. A 75 kW (100 hp) single shaft engine under development was analytically downsized to 37 kW (50 hp) and analyzed with a metal belt continuously variable transmission in a synthesized car. With gasoline, a 25% advantage was calculated over that of a current spark ignition engine, scaled to the same power, using the same transmission and car. With diesel fuel, a 21% advantage was calculated over that of a similar diesel engine vehicle. Author

N82-26052# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

ELECTRIC VEHICLE POWER CONTROLLER M.S. Thesis

John C. Frazier Dec. 1981 116 p refs

(AD-A111093; AFIT/GAE/AA/81D-1) Avail: NTIS HC A06/MF A01 CSCL 09/2

The design of a general purpose microcomputer-based control system for an electric vehicle drive unit is described. This is a research and development system designed with an active operator interface for evaluating performance, dynamic control, parameter modification, and test program interaction. A microcomputer controller processes speed commands and monitors battery energy consumption during the driving cycle. This design effort demonstrated that a unique one-of-a-kind microcomputer controller is easy to construct and interface with the vehicle's systems. Author

N82-26053# Los Alamos Scientific Lab., N. Mex.

ANALYSIS OF ALTERNATE-FUELED PASSENGER VEHICLES: A SAMPLE TECHNOLOGY ASSESSMENT

A. T. Peaslee, Jr. and G. R. Thayer Oct. 1981 18 p refs

(Contract W-7405-eng-36)

(DE82-004190; LA-9068-MS) Avail: NTIS HC A02/MF A01

Ten passenger vehicles powered by the following were characterized on a common engineering and economic basis: gasoline internal combustion, diesel internal combustion, liquid-hydrogen internal combustion, liquid-hydrogen fuel cell, hydrogen internal combustion, hydrogen fuel cell, methanol internal combustion, methanol fuel cell, Ni/Zn battery, and Pb/Acid battery. Levelized life cycle costs were computed for each vehicle. The market penetration of the nongasoline vehicles was studied over a 50 yr period using a generalized equilibrium energy economic model. Results indicate that only the methanol internal combustion vehicle using methanol produced from coal is a viable alternative to the gasoline internal combustion vehicle. The market penetration of alternate vehicles was enhanced more by reduction in acquisition costs than by comparable improvements in engineering parameters. DOE

N82-26054# Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.

URBAN TRANSPORTATION ENERGY ACCOUNTS. VOLUME 1: PROCEDURES. VOLUME 2: CASE STUDY OF THE CHICAGO REGION Final Report, Jun. 1978 - May 1981

D. E. Boyce, M. C. Romanos, B. N. Janson, P. Prastacos, M. Ferris, and R. W. Eash (Chicago Area Transportation Study) Sep. 1981 255 p refs 2 Vol.

(Contract DOT-IL-11-0027)

(PB82-135542; UMTA-IL-11-0027-81-1) Avail: NTIS HC A12/MF A01 CSCL 10A

Procedures for compiling a set of urban transportation energy accounts are described. These procedures deal specifically with ground-mode person travel in an urbanized area but could be generalized to other modes, commodities and regions. There are several significant differences between these procedures and methods used by other studies to estimate the energy consumption of urban person trips. First, these procedures produce estimates of both direct and indirect energy consumption. Second, energy consumption is computed by mode for each origin-destination pair of zones. Third, automobile speeds and transit vehicle occupancies calculated for individual link flows are used to estimate energy consumption per person trip over each zone to zone trip path. GRA

88 SPACE SCIENCES (GENERAL)

N82-26055*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

X-RAY ASTRONOMY THE 1980'S

Stephen S. Holt, ed. Nov. 1981 620 p refs Proc. of a Workshop held at Greenbelt, Md., 5-7 Oct. 1981

(NASA-TM-83848; NAS 1.15:83848) Avail: NTIS HC A99/MF A01 CSCL 03A

The status of the current understanding of important problems to which X-ray astronomical techniques can be applied is summarized and the prospects for such research in the future is discussed. Relatively near-term X-ray astronomical research objectives are presented. The importance of a continuing program of balloon-borne research as a cost effective means by which studies at energies in excess of 20 keV may be performed is emphasized. The scientific opportunities presented by the Space Transpotation System to develop low cost experiments which are beyond the scope of balloon-borne capabilities are also highlighted. For individual titles, see N82-26056 through N82-26086.

N82-26056*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.

CORONAE OF NONDEGENERATE SINGLE AND BINARY STARS: A SURVEY OF OUR PRESENT UNDERSTANDING AND PROBLEMS RIPE FOR SOLUTION c93

Jeffrey L. Linsky *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 13-36 refs (For primary document see N82-26055 16-88)

(Grants NGL-06-003-057; NAG-8316; NAG-8334; NAG-8382; NAG-8400)

Avail: NTIS HC A99/MF A01 CSCL 03B

Information about the coronae of stars in different portions of the HR diagram, and how the characteristics of such coronae compare with what is known about the solar corona are reviewed. For each type of star, some unanswered questions and the generic type of X-ray instrument required to answer these questions are listed. The survey points out the critical need for a sensitive X-ray instrument with both moderate spectra resolution and imaging capability that can monitor selected targets for long periods of time. There is also a need for high spectral resolution,

provided sensitivities can be improved greatly over Einstein, and near simultaneous ultraviolet spectroscopy. T.M.

N82-26057*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
CONTINUUM AND LINE SPECTRA OF DEGENERATE DWARF X-RAY SOURCES **c93**
Don Q. Lamb *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 37-67 refs (For primary document see N82-26055 16-88)
(Grant NAGw-246)
Avail: NTIS HC A99/MF A01 CSCL 03B

Recent observations of X-ray sources are summarized. Unresolved issues concerning these sources are discussed and an outline of the kinds of X-ray observations that would best advance the understanding of these sources is presented. T.M.

N82-26058*# Illinois Univ. - Urbana, Champaign. Dept. of Physics.
NEUTRON STAR BINARIES, PULSARS AND BURST SOURCES **c93**
Fred K. Lamb *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 77-106 refs (For primary document see N82-26055 16-88)
(Grants NsG-7653; NSF PHY-80-25605)
Avail: NTIS HC A99/MF A01 CSCL 03B

Unresolved issues involving neutron star binaries, pulsars, and burst sources are described. Attention is drawn to the types of observations most likely to resolve them. Many of these observations are likely to be carried out during the next decade by one or more missions that have been approved or proposed. Flux measurements with an imaging detector and broad-band spectroscopic studies in the energy range 30-150 keV are discussed. The need for soft X-ray and X-ray observations with an instrument which has arcminute angular resolution and an effective area substantially greater than of ROSAT or EXOSAT is also discussed. T.M.

N82-26059*# Colorado Univ., Boulder. Lab. for Atmospheric and Space Physics.
X-RAY SPECTROSCOPIC OBSERVATIONS AND MODELING OF SUPERNOVA REMNANTS **c89**
J. Michael Shull *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 107-117 refs Prepared in cooperation with the Joint Inst. for Lab. Astrophysics (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 03A

The X-ray observations of young remnants and their theoretical interpretation are described. A number of questions concerning the nature of the blast wave interaction with the interstellar gas and grains and of atomic processes in these hot plasmas are considered. It is concluded that future X-ray spectrometers with high collecting area, moderate spectral resolution and good spatial resolution can make important contributions to the understanding of supernova remnants in the Milky Way and neighboring galaxies and of their role in the global chemical and dynamical evolution of the interstellar medium. T.M.

N82-26060*# Massachusetts Inst. of Tech., Cambridge. Dept. of Physics.
INTERSTELLAR, INTRACLUSTER AND SUPERCLUSTER GAS **c90**
Lennox L. Cowie *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 119-132 refs (For primary document see N82-26055 16-88)
(Grants NAGw-208; NsG-7643; NGL-22-009-638)
Avail: NTIS HC A99/MF A01 CSCL 03B

Hot tenuous plasmas with temperatures in the range 1,000,000 to 3.10 to the 8th power K and densities of .000001 to .001 per cu cm are considered. The dominant radiation processes are thermal bremstrahlung and collisional line excitation and all except the very hottest objects will have observable X-ray emissions lines. The most important unifying point is the angular scales involved. For the interstellar gas, structure ranging in size from about 10 ft to tens of degrees is expected. T.M.

N82-26061*# Institute of Astronomy, Cambridge (England).
X-RAY EMISSION FROM GALAXIES AND THE UNIVERSE **c90**
A. C. Fabian *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 133-141 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 03B

The study of X-ray emission from normal galaxies began with the launch of the Einstein Observatory in 1978. Galaxies of all Hubble types and point sources are discussed. It is concluded that statistical studies of bright Galactic sources, which relate to their evolution, are reliant upon the discovery of sources in many galaxies. It is also concluded that a substantial future increase (the Virgo cluster galaxies) requires a telescope system with better than arcminute resolution and a sensitivity better than 10 x that of Einstein. T.M.

N82-26062*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
X-RAYS FROM QUASARS AND ACTIVE GALAXIES **c93**
Alan P. Lightman *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 143-182 refs (For primary document see N82-26055 16-88)
(Grant NAGw-246)
Avail: NTIS HC A99/MF A01 CSCL 03B

Features of quasars and active galactic nuclei are discussed and include: the nature of the power source, the radiation processes, and the mechanism for the formation and collimation of long-lived jets of matter observed to emanate from the center of these of these objects. The phenomena that produce X-rays are highlighted. T.M.

N82-26063*# Mullard Space Science Lab., Dorking (England).
A EUROPEAN X-RAY ASTROPHYSICS MISSION **c93**
J. Len Culhane *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 183-217 refs Prepared in cooperation with University College, London (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 09B

Five instruments (Bragg Spectrometer, Large Area Proportional and Scintillation Counter Detectors, Wide Field X-ray Cameras and a Gamma-Ray Burst Monitor) are discussed and estimates of their performance are given. Their scientific aims are summarized and sample observing programmes are discussed. T.M.

N82-26064*# Institute of Space and Astronautical Science, Tokyo (Japan).
X-RAY ASTRONOMY PROGRAM IN JAPAN **c89**
Yasuo Tanaka *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1982 p 219-226 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 03A

Hakucho satellite operations and the problems that emerged from the neutron star observations are illustrated. X-ray pulsars and bursters are reviewed. Future satellite programs are outlined. N.W.

N82-26065*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
THE LAMAR: A HIGH THROUGHPUT X-RAY ASTRONOMY FACILITY FOR A MODERATE COST MISSION **c89**
Paul Gorenstein and Daniel Schwartz *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 227-269 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 03A

The performance of a large area modular array of reflectors (LAMAR) is considered in several hypothetical observations relevant to: (1) cosmology, the X-ray background, and large scale structure of the universe; (2) clusters of galaxies and their evolution; (3) quasars and other active galactic nuclei; (4) compact objects in our galaxy; (5) stellar coronae; and (6) energy input to the interstellar medium. N.W.

N82-26066*# Lockheed Missiles and Space Co., Palo Alto, Calif.
A WOLTER TYPE I LAMAR **c89**

R. C. Catura and E. G. Joki *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 271-287 refs (For primary document see N82-26055 16-88)
(Contracts NAS5-23563; NAS5-26090)
Avail: NTIS HC A99/MF A01 CSCL 03A

Observational objectives for the LAMAR and their influence on the instrument design are discussed. It is concluded that the most important design parameter is the angular resolution of the LAMAR modules since it so strongly influences sensitivity, optical identifications, source confusion, spectral resolution for objective gratings and the ability to resolve small extended sources. A high resolution Wolter Type I LAMAR module is described, its hardware status discussed, and the performance of a LAMAR observatory presented. A promising technique for enhancing the reflectivity of Wolter Type I X-ray optics in a selected bandpass at high energy has been investigated and the performance of the LAMAR module, utilizing this method, has been calculated. Author

N82-26067*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PERFORMANCE OF SINGLE PHOTON-COUNTING X-RAY CHARGE COUPLED DEVICES c35
Guenter R. Riegler, R. A. Stern, K. Liewer, F. Vescelus, J. A. Nousek (Pennsylvania State Univ., State College), and Gordon P. Garmire (Pennsylvania State Univ., State College) *In* NASA. Goddard Space Flight Center X-ray Astronomy in 1980's Nov. 1981 p 289-299 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 14B

Results of intial performance tests on X-ray sensing properties of charge-coupled devices (CCDs) are presented. CCDs have demonstrated excellent spatial resolution and good spectral resolution, superior to that of non-imaging proportional counters. Author

N82-26068*# Columbia Univ., New York. Astrophysics Lab.
AN IMAGING GAS SCINTILLATION PROPORTIONAL COUNTER FOR THE DETECTION OF SUBKILOELECTRON-VOLT X-RAYS c35
Charles J. Hailey, William H.-M. Ku, and Michael H. Vartanian *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 301-318 refs (For primary document see N82-26055 16-88)
(Grant NGR-33-008-102)
Avail: NTIS HC A99/MF A01 CSCL 14B

A large area imaging gas scintillation proportional counter (IGSPC) was constructed for use in X-ray astronomy. The IGSPC consists of a gas scintillation proportional counted (GSPC) with a micron polyprotylene window coupled to a multiwire proportional counter (MWPC) via a calcium fluoride window. Over a sensitive area of 21 cu cm the instrument has a measured energy resolution of 17.5% (FWHM) and 1.9 mm (FWHM) spatial resolution at 1.5 keV. Author

N82-26069*# Massachusetts Inst. of Tech., Cambridge.
A WIDE-FIELD SOFT X-RAY CAMERA c35
Robert Petre *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 319-323 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 20F

A wide-field soft X-ray camera (WFSXC) sensitive in the 50 to 250 eV band is described. The camera features Wolter-Schwarzschild optics with an 8 degree field of view and 300 cu cu collecting area. The focal plane instrument is a microchannel plate detector. Broad-band energy discrimination is provided by thin-film filters mounted immediately in front of the focal plane. The WFSXC is capable of detecting sources with intensities greater than 5 percent of HZ 43 during typical sounding rocket exposures, and it would approach the same sensitivity range as EUVE during a typical exposure from the Shuttle. Author

N82-26070*# Northwestern Univ., Evanston, Ill. Dept. of Physics and Astronomy.
X-RAY IMAGING ABOVE 3 keV c74
Melville P. Ulmer *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 325-334 ref (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 20F

Energy dependent X-ray maps of clusters of galaxies are discussed. A design for a stacked, etched grid collimator is discussed. N.W.

N82-26071*# California Univ., San Diego. Center for Astrophysics and Space Sciences.
TEMPORAL APERATURE MODULATION c74
Raymond J. Proctor *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 35-348 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 20F

The two types of modulation techniques useful to X-ray imaging are reviewed. The use of optimum coded temporal aperature modulation is shown, in certain cases, to offer an advantage over a spatial aperture modulator. Example applications of a diffuse anisotropic X-ray background experiment and a wide field of view hard X-ray imager are discussed. T.M.

N82-26072*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
HARD X-RAY IMAGING FROM EXPLORER c89
Jonathan E. Grindlay and S. S. Murray *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 349-366 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 03A

Coded aperture X-ray detectors were applied to obtain large increases in sensitivity as well as angular resolution. A hard X-ray coded aperture detector concept is described which enables very high sensitivity studies persistent hard X-ray sources and gamma ray bursts. Coded aperture imaging is employed so that approx. 2 min source locations can be derived within a 3 deg field of view. Gamma bursts were located initially to within approx. 2 deg and X-ray/hard X-ray spectra and timing, as well as precise locations, derived for possible burst afterglow emission. It is suggested that hard X-ray imaging should be conducted from an Explorer mission where long exposure times are possible. E.A.K.

N82-26073*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
THE STELLAR CORONAL X-RAY EXPLORER: STCOEX c89
Giuseppe S. Vaiana *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 371-377 refs (For primary document see N82-26055 16-88)
(Grant NsG-7176)
Avail: NTIS HC A99/MF A01 CSCL 03A

The status of the newly born field of stellar X-ray astronomy is considered. The need for further observational capability, the study of stellar surface activity and the development of design criteria for a follow-up mission, with primary emphasis on stellar observations and with general capabilities within the scope of the Explorer program are examined. The criteria which lead to the desired instrumental capabilities are reviewed; and an overview of the proposed instrument and some of its capabilities, as indicated by simulations is presented. Two versions of a trial payload the stellar coronal. Explorer (STCOEX) which meet the observational desirable are developed. E.A.K.

N82-26074*# Wisconsin Univ. - Madison. Dept. of Physics.
A DIFFUSE SOFT X-RAY SPECTROMETER c35
Dan McCammon *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 379-401 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 14B

A design for a diffuse X-ray spectrometer utilizing Bragg reflection is described. The geometry has a very high throughput for a given physical size and allows simultaneous observation at all wavelengths within its range. Spectral resolving power is about 35 to 50. A similar unit equipped with thallium acid pthallate crystals will cover the 11 - 24 A-range with about half this throughput and twice the resolving power. E.A.K.

N82-26075*# Colorado Univ., Boulder. Lab. for Atmospheric and Space Physics.

REQUIREMENTS FOR HIGH QUALITY X-RAY SPECTROSCOPY IN AN EXPLORER CLASS MISSION c35

Webster C. Cash, Jr. *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 403-424 refs (For primary document see N82-26055 16-88)
(Grant NAG5-96)
Avail: NTIS HC A99/MF A01 CSCL 14B

Through the use of simulated X-ray spectra the question of instrument requirements for a spectrograph that could significantly advance X-ray astronomy is addressed. It it concluded that resolution (lambda/delta lambda) in the range of 200 to 500, and effective collecting area in excess of 200 sq cm are required. One design, based on the objective reflection grating concept, which would meet these stringent requirements in an Explorer class mission is presented. E.A.K.

N82-26076*# Massachusetts Inst. of Tech., Cambridge. Center for Space Research.

FUTURE PROSPECTS FOR HIGH RESOLUTION X-RAY SPECTROMETERS c35

Claude R. Canizares (Cambridge Univ.) *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 425-440 refs Sponsored in part by the Royal Society of England and the Alfred P. Sloan Foundation (For primary document see N82-26055 16-88)
(Contract NAS8-30752)
Avail: NTIS HC A99/MF A01 CSCL 14B

Capabilities of the X-ray spectroscopy payloads were compared. Comparison of capabilities of AXAF in the context of the science to be achieved is reported. The Einstein demonstrated the tremendous scientific power of spectroscopy to probe deeply the astrophysics of all types of celestial X-ray source. However, it has limitations in sensitivity and resolution. Each of the straw man instruments has a sensitivity that is at least an order of magnitude better than that of the Einstein FPSC. The AXAF promises powerful spectral capability. E.A.K.

N82-26077*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

BROAD BAND X-RAY TELESCOPE (BBXRT) c89

Peter J. Serlemitsos *In its* X-ray Astronomy in the 1980's Nov. 1981 p 441-460 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 03A

An approach along with corroborating measurements for significantly enhancing the potential of Si(Li) spectrophotometry in X-ray astronomy is presented. The key new element is an unconventional X-ray mirror that meets qualifications of low cost, light weight, and large throughput over a broad energy band at moderate angular resolution. The potential for other applications is also discussed. E.A.K.

N82-26078*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SOME OBSERVATIONAL TESTS OF X-RAY PULSAR EMISSION MODELS c89

Peter Meszaros (Maryland Univ., College Park) *In its* X-ray Astronomy in the 1980's Nov. 1981 p 461-469 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 03A

The understanding of neutron star physics which relies heavily on knowing values of their mass, radius and magnetic field strength was studied. The only information about these till now comes from the surface radiation. Major uncertainties concerning the nature of the mass exchange and the accretion flow, the magnetopause structure, the infall deceleration, the actual pulsation mechanism and the atmosphere geometry are examined. The alternatives and several possible observational tests are discussed. E.A.K.

N82-26079*# Erlangen-Nuremberg Univ. (West Germany). Inst. fuer Theoretische Physik.

OBSERVABILITY OF ATOMIC LINE FEATURES IN STRONG MAGNETIC FIELDS c72

Guenter Wunner, H. Ruder, H. Herold, and J. Truemper (Max-Planck-Inst. fuer Physik und Astrophysik, Garching) *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 471-476 refs Sponsored in part by Deutsche Forschungsmeinschaft (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 20H

The physical properties of atoms in superstrong magnetic fields, characteristic of neutron stars, and the possibility of detecting magnetically strongly shifted atomic lines in the spectra of magnetized X-ray pulsars are discussed. It is suggested that it is recommendable to look for magnetically strongly shifted Fe 26 Lyman lines in rotating neutron stars of not too high luminosity using spectrometers working in the energy range 10 - 20 keV, with sensitivities > to minus 4 power photons per sq cm and second, and resolution E/delta E approx. 10-100. E.A.K.

N82-26080*# Argonne National Lab., Ill.

A NEW METHOD FOR FOCUSING AND IMAGING X-RAYS AND GAMMA-RAYS WITH DIFFRACTION CRYSTALS c74

Robert K. Smither *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 477-495 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 20F

Bent diffraction crystals in which the intercrystalline-plane spacing is varied as a function of position in the crystal are used to focus monochromatic radiation from a point source or parallel beam down to a point image. Conversely, radiation from a point source can be focused into an outgoing parallel beam. The Bragg angle for diffraction of monochromatic radiation will now vary as a function of position in the crystal and this new degree of freedom is used to obtain focusing and imaging of the diffracted beam. This approach to focusing and imaging is applied to the design of a large-area, high resolution X-ray telescope that is also a high resolution monochromator with the unique feature that the width of the energy increment that is diffracted can be controlled and varied during the operation of the instrument. The field can be scanned with a wide energy increment and then switched to a narrow energy increment for the high resolution work. Both transmission and reflection type diffraction crystals can be used. A.R.H.

N82-26081*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.

HIGH-RESOLUTION IRON-LINE SPECTROSCOPY c35

Richard E. Griffiths *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 497-522 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 14B

Methods of resolving the iron lines, the most common X-ray emission lines in both galactic and extragalactic X-ray sources, are reviewed. A self-focussing crystal spectrometer is shown to be the most suitable instrument, and the optimum crystal geometry is spherical (Schnopper and Taylor 1980). The principles of operation of such a spherical crystal imaging spectrometer are examined and its sensitivity is shown to be two orders of magnitude better than a focal plane crystal spectrometer on AXAF. A Spacelab version of this payload would be very cost-effective. Author

N82-26082*# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.

LABORATORY STUDIES ON A SPHERICALLY CURVED BRAGG SPECTROMETER FOR COSMIC X-RAY SPECTROSCOPY c35

M. Cantin, L. Koch-Miramond, B. Mougin, and R. Rocchia *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980' Nov. 1981 p 523-526 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 14B

A spherical array of twenty LiF 200 crystals was built to test the performances of a freestanding, self-focussing spherical crystal cosmic X-ray spectrometer. Measurements presently available show that the size of the image for a point source at infinite distance would be 3 mm (FWHM) along the focalisation axis and 2.1 mm (FWHM) along the dispersion axis. The mosaic spread on individual crystals is less than 0.1 degree. A slightly systematic deviation from the ideal bending (0.1 degree) is observed at the edges of most crystals and this appears to be the major limitation to spectrometer performance. Author

N82-26083*# Danish Space Research Inst., Lyngby.
CYLINDRICAL CRYSTAL IMAGING SPECTROMETER (CCIS) FOR COSMIC X-RAY SPECTROSCOPY c74
Herbert W. Schnopper and Paul O. Taylor (Harvard-Smithsonian Center for Astrophysics) *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 527-547 refs Sponsored in part by DOE (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 20F

A 'stigmatic' focusing, Bragg crystal spectrometer was developed and used for high spectral resolution X-ray emission line diagnostics on hot laboratory plasmas. The concept be applied at the focal plane of an orbiting X-ray telescope where it offers several advantages over conventional spectrometers, i.e., mechanical simplicity, high resolving power and sensitivity, simultaneous measurement of an extended segment of spectrum, and good imaging properties. The instrument features a simple, unambiguous, non-scanning spectrum readout that is not adversely affected by either spacecraft pointing error or source extent. The performance of the instrument is estimated in the context of the Advanced X-Ray Astrophysical Facility mission. Author

N82-26084*# California Univ., San Diego. Center for Astrophysics and Space Sciences.
SPECTROSCOPY IN THE 10 keV TO 10 MeV RANGE c89
James L. Matteson *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 549-566 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 03A

Spectral lines in the 10 keV to 1 MeV range carry information of fundamental importance on many astronomical objects. Since the lines are directly related to specific physical processes this information is model independent and gives the physical conditions in the objects. At the sensitivities achieved to date, approximately 0.0001 to 0.001 phsq cm. sec for steady sources and approximately 0.01 to 1 ph/sq cm sec for transient sources, lines were detected from the galactic center, gamma-ray bursts and transients, X-ray pulsators, the Crab pulsar and solar flares. Future instruments with a factor of approximately 100 sensitivity improvement will allow detailed spectroscopic study of these classes of objects as well as supernova remnants, active galaxies and the interstellar medium. This sensitivity improvement can be obtained through the use of detector technology already proven in balloon and satellite instruments. Author

N82-26085*# Columbia Univ., New York. Astrophysics Lab.
SPECTROSCOPY FROM 2 TO 200 keV c89
David J. Helfand, Gary A. Chanan, Robert Novick, Crawford J. MacCallum (Sandia Lab., Albuquerque), and Marvin Leventhal (Bell Telephone Labs.) *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 567-598 refs (For primary document see N82-26055 16-88)
(Contract NAS5-26041)
(CONTRIB-216) Avail: NTIS HC A99/MF A01 CSCL 03A

The astrophysical processes responsible for line and continuum emission in the spectra range 2 keV to 200 keV are examined from the viewpoint of designing a spectrometer which would operate in this regime. Phenomena considered include fluorescent line radiation in X-ray binaries, magnetically shifted iron lines and cyclotron emission from neutron star surfaces, line emission from cosmically abundant elements in thermal plasmas, and nuclear deexcitation lines in fresh nucleosynthetically produced matter. An instrument consisting of a approximately 10 sq cm array of planar germanium detectors surrounded by a large sodium-iodide anticoincidence shield is described and projected background rates and sensitivities are considered. A sample observing program for a two-day shuttle-based mission is included as an example of the wide range of scientific questions which could be addressed by such an instrument. Author

N82-26086*# California Univ., San Diego.
HARD X-RAY ASTROPHYSICS c89
Richard E. Rothschild *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 599-620 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 03A

Past hard X-ray and lower energy satellite instruments are reviewed and it is shown that observation above 20 keV and up to hundreds of keV can provide much valuable information on the astrophysics of cosmic sources. To calculate possible sensitivities of future arrays, the efficiencies of a one-atmosphere inch gas counter (the HEAO-1 A-2 xenon filled HED3) and a 3 mm phoswich scintillator (the HEAO-1 A-4 Na1 LED1) were compared. Above 15 keV, the scintillator was more efficient. In a similar comparison, the sensitivity of germanium detectors did not differ much from that of the scintillators, except at high energies where the sensitivity would remain flat and not rise with loss of efficiency. Questions to be addressed concerning the physics of active galaxies and the diffuse radiation background, black holes, radio pulsars, X-ray pulsars, and galactic clusters are examined. A.R.H.

N82-26087# European Space Agency, Paris (France).
THE SOLAR SYSTEM AND ITS EXPLORATION
W. R. Burke, comp. Nov. 1981 272 p refs Proc. of Alpbach Summer School Conf., Austria, 29 Jul. - 7 Aug. 1981; sponsored by ESA, CNES and DFVLR Original contains color illustrations (ESA-SP-164; ISSN-0379-6566) Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU CN and NO (+20% others)

The origin and evolution of the solar system were discussed. The interaction of the solar wind with the planetary magnetospheres, the boundary conditions and the planetary environments were considered. Planetary atmospheres and Moons were dealt with. Comets, and the technical aspects of space missions were covered. For individual titles, see N82-26088 through N82-26115.

N82-26088# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
THE PLASMA PHASE OF THE EVOLUTION OF THE SOLAR SYSTEM c90
H. Alfven *In* ESA The Solar System and its Exploration Nov. 1981 p 3-10 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

Magnetospheric research and laboratory evidence are used to argue that plasma dominated processes were essential for the evolution of interstellar clouds and of circumsolar cloud up to the transition from the plasma to the planetesimal phase. Interstellar clouds could be formed by electromagnetic contraction which would also increase cloud density, bringing it to the limit of gravitational collapse without recourse to a triggering mechanism. In a dusty plasma cloud, large particles serve as a core around which gaseous components can collapse. The inhomogeneity of the clouds causes them to fragment into stellesimals which accrete into protostars. Planets are formed in a semistationary process by matter from the primeval cloud penetrating a void around the protostar. Satellites are formed similarly. Chemically differentiated small clouds of neutral gas and dust reach the central body via a low plasma density region. The gas is stopped and ionized when it attains the critical velocity. This explains the band structure of the solar system.
Author (ESA)

N82-26089# Centre National d'Etudes Spatiales, Toulouse (France). Div. Analyse de Missions-Prospective.
MISSION TECHNIQUES AND ORBITAL MECHANICS FOR INTERPLANETARY SPACECRAFT c17
Alain Perret *In* ESA The Solar System and its Exploration Nov. 1981 p 13-22 (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

General equations of spacecraft motion are presented and the interplanetary rendezvous problem is treated in a simplified force model. The principles of the use of gravitational perturbations during a flyby of a celestial body are exposed, using Venus, Earth, Mars, and Jupiter as examples. Orbit determination through range and range rate tracking is described. Propulsion and attitude control are discussed. Author (ESA)

N82-26090# Universitaets-Sternwarte Goettingen (West Germany).
THE SUN AS A STAR c92

W. Deinzer *In* ESA The Solar System and its Exploration Nov. 1981 p 25-28 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

The Sun and the theory of stellar structure, solar rotation, the solar cycle, and the solar magnetic field are discussed. The validity of solar models which adjust Prandtl's mixing length and helium abundance so that radius and luminosity match their solar values is tested. The fragmentary state of turbulence theory prevents investigation of the hydrogen convection zone from providing quantitative validation. Evidence based on solar neutrino flux and nonradial solar oscillations is not decisive. The transport of angular momentum towards the equator, resulting in differential rotation, could be due to anisotropic viscosity caused by turbulent eddies in the convection zone, Rossby waves, or convection. The pairwise appearance of sunspots and their migration towards lower latitudes are accounted for in numerical solutions of the modified induction equation. These show that strong toroidal flux tubes, of opposite sign in each half cycle, are produced. Author (ESA)

N82-26091# Oxford Univ. (England). Dept. of Theoretical Physics.
THE SOLAR ATMOSPHERE: FROM PHOTOSPHERE TO CORONA c92
C. Jordan *In* ESA The Solar System and its Exploration Nov. 1981 p 29-39 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

Developments in solar physics, emphasizing areas where observations from space contribute substantially, are reviewed. Progress in establishing the temperature and density structure of the outer solar layers is made through measurements of emission line fluxes in the extreme UV and X-ray wavelengths combined with spatial information from imaging instruments. The processes by which the corona and other hot plasma are heated remain elusive. Although the source of the heating is considered to be the interaction between gas motions and the magnetic fields in the subphotospheric convective zone, the means by which energy is transported and dissipated are unknown. Observations required to limit the range of possible mechanisms are discussed. Author (ESA)

N82-26092# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
HELIOS MISSION: MISSION OBJECTIVES, MISSION VERIFICATION, SELECTED RESULTS c91
Herbert Porsche *In* ESA The Solar System and its Exploration Nov. 1981 p 43-50 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

Investigations of the interplanetary matter between the Sun and the Earth orbit, i.e. its composition, dynamics, and solar influences on it, are summarized. Solar plasma experiments indicate regular periodicity in the onset of high speed particle streams. Particle energy and direction discrimination are measured by half or quarter sphere condensors. Only particles coming from the plane of incidence, traveling at an energy adequate with respect to condensor radius and applied voltage can penetrate the system. Channeltrons are used as detectors. Flux gate and search coil magnetometers are employed. Cosmic ray experiments use similar techniques. Photometer results determine the symmetry plane of the interplanetary dust cloud. Evidence of nonlinear Alfven waves within the corona is mentioned. Author (ESA)

N82-26093# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
THE INTERNATIONAL SOLAR POLAR MISSION (ISPM) c92
R. G. Marsden and K.-P. Wenzel *In* ESA The Solar System and its Exploration Nov. 1981 p 51-59 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

The instrumentation and mission objectives of ISPM are described. The ISPM explores the heliosphere within a few astronomical units of the Sun over the full range of heliographic latitudes. The prime mission objective is to study, as a function of solar latitude, the properties of the interplanetary medium and solar corona. It uses a Jupiter gravity-assist to achieve a high solar latitude trajectory. The scientific instrumentation is designed to explore, in the third heliospheric dimension, the properties of the solar corona, the solar wind, the Sun-wind interface, the heliospheric magnetic field, solar radio bursts and plasma waves, solar and galactic cosmic rays, and interplanetary/interstellar neutral dust and gas. Author (ESA)

N82-26094# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
THE EARLY EVOLUTION OF PLANETS c90
H. Alfven *In* ESA The Solar System and its Exploration Nov. 1981 p 65-73 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

The transition from the plasma phase to the planetesimal phase and the accretion of planetesimals to planets and satellites are discussed. The 2/3 fall down theory is analyzed in light of Voyager 1 Saturn results and asteroidal ring data. While model predictions of Saturn ring macrostructure are accurate to within a few percent, and slightly better for the asteroidal ring, a model which calculates density, degree of ionization and magnetic field limits is required. Accretion of planetesimals to larger bodies is dominated by mechanical forces, but for giant planets the neutral gas resulting from plasma deionization becomes important. These planets are possibly formed from thousands of lunar size bodies whose atmospheres consisted of gas condensing from the plasma. Author (ESA)

N82-26095# Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau (West Germany).
MAGNETOSPHERIC SUBSTORM MORPHOLOGY c46
G. Kremser *In* ESA The Solar System and its Exploration Nov. 1981 p 77-84 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

A substorm definition is discussed, and substorm signatures observed from the ground are illustrated. Substorm phenomena in space, and mathematical models which describe them are considered. Balloon-satellite measurements of a substorm onset are presented. In model A, plasma sheet thinning is regarded as being responsible for triggering the substorm. Reconnection of field lines can take place Earthward of the quiet time reconnection region, forming a magnetically neutral line at which strong particle acceleration can take place. Model B neglects near Earth reconnection and assumes that plasma sheet thinning is a consequence of substorm processes. The substorm starts when the near Earth plasma sheet particles are suddenly displaced Earthward (plasma injection). Satellite results show that electron precipitation in the auroral zone is related to field aligned electron fluxes at geosynchronous orbit, and particle injection in the equatorial plane takes place near the satellite or inside the geosynchronous orbit, supporting model B. Author (ESA)

N82-26096# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
THE SCIENTIFIC OBJECTIVES OF THE GEOS MISSION c12
R. Grard and K. Knott *In* ESA The Solar System and its Exploration Nov. 1981 p 85-95 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

Observations with GEOS 1 and 2 are summarized. The magnetosphere response to the highly variable flow of solar plasma which approaches the Earth, e.g. in situ waves, fields and particles over wide frequency and energy ranges, is studied. Results show that during magnetic substorms, plasma injection is associated with large dawn-dusk electric fields. The survey of the magnetospheric mass composition shows an increase of the heavy ion population with solar and magnetic activity. Hot protons injected from the tail into a magnetospheric plasma rich in Helium

(10%) give rise to instabilities at around the Helium gyrofrequency. Electrons with energy of 100 eV and a 90 deg pitch angle are observed in conjunction with the emission of electron cyclotron harmonic waves. Pulsations with periods of 1 to 10 min are simultaneously observed with magnetic and electric field detectors; these oscillations also modulate the flux of energetic ions and electrons. Author (ESA)

N82-26097# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
MEASUREMENT OF PLASMA DRIFTS IN PLANETARY MAGNETOSPHERES **c91**
R. Grard, G. Haerendel, and F. Melzner (Max-Planck Inst. fuer Extraterristrische Physik, Garching, West Germany) *In* ESA The Solar System and its Exploration Nov. 1981 p 97-104 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

The GEOS satellites instrumentation is described. Plasma drift velocity and electric field are measured simultaneously and independently. The electric field sensor is an antenna made of two spherical probes separated by a distance of 40 m along a direction perpendicular to the spin axis. The field component measured by the aerial is derived from the difference between the electric potential of the two electrodes. The strength and orientation of the total field vector is computed, assuming that the electric and ambient magnetic fields are perpendicular. Plasma drift is measured, using four electron guns and one electron detector. The drift is evaluated by injecting an artificial beam with a 90 deg pitch angle and measuring its displacement after one or two gyrations. Author (ESA)

N82-26098# Academy of Sciences (USSR), Moscow. O. Y. Schmidt Inst. of Physics of the Earth.
FORMATION OF PLANETS **c90**
E. L. Ruskol *In* ESA The Solar System and its Exploration Nov. 1981 p 107-113 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

A model of planetary evolution is proposed. The evolution of a photoplanetary gas-dust cloud, laminarly rotating around the Sun in the boundaries of the present planetary system, results in the formation of solid planetesimals grouped in concentric zones of growing embryo planets. The growth of terrestrial planets takes about 100 million years, several times longer than the period of dissipation of gas from the inner parts of the protoplanetary cloud. The formation of giant planets is a two-stage process: the formation of nuclei from the solid material with mass 2 to 3 Earth masses in 10 to 100 million years, then the gaseous accretion on nuclei in 100,000 to 1 million years. The origin of satellites is a process accompanying the growth of planets on the most active stage, via circumplanetary swarms for terrestrial planets and accretional disks for giants.
Author (ESA)

N82-26099# Institut fuer Allgemeine und Angewandte Geophysik, Munich (West Germany).
PLANETARY AND LUNAR MAGNETISM **c91**
J. Pohl *In* ESA The Solar System and its Exploration Nov. 1981 p 115-120 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

Knowledge on intrinsic planetary magnetic fields is summarized. For the Earth, the spatial configuration and the present and past time variations of the internally generated field are known in detail. Important features are secular changes of nondipole components, of the dipole orientation and strength, and frequent polarity reversals. Today the Moon has no detectable dipole moment, but magnetic field measurements show widespread magnetization of the lunar crust and lunar rocks have strong stable remanent magnetizations, which indicate the presence of magnetic fields between 3 and 4 Gyr ago. The origin of these fields and the magnetizing processes of lunar rocks are not known. Author (ESA)

N82-26100# Newcastle-upon-Tyne Univ. (England).
HEAT TRANSFER AND THE DEVELOPMENT OF PLANETARY STURCTURE **c91**
D. C. Tozer *In* ESA The Solar System and its Exploration Nov. 1981 p 121-126 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

Observational data and theoretical arguments for rejecting Benfield's planetary accumulation model are presented. A model in which the gravitational potential energy released by an accumulation is more uniformly dissipated throughout the planetary interior by a radiation of seismic energy from the points of collision is proposed. This leads to predictions for the Moon and Mercury. Convective heat transfer theory is used to explain the early melting of the Moon's surface and highland differentiation. A model which allows for a parallel growth of a gradually diminishing number of protoplanetary objects is dynamically the most favored, but it leads to indistinguishably different predictions about the observable planetary states. Author (ESA)

N82-26101# Ludwig-Maximilians-Universitaet, Munich (West Germany). Inst. fuer Allgemeine und Angewandte Geologie.
SURFACE HISTORY OF THE TERRESTRIAL-TYPE PLANETS **c91**
Gerhard Neukum *In* ESA The Solar System and its Exploration Nov. 1981 p 129-137 refs Original contains color illustrations (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

The ancient impact records of Mercury, Mars, Earth's Moon, and of the satellites of Jupiter and Saturn are analyzed, using spacecraft imagery. The use of multispectral imagery in planetary surface studies for obtaining information on mineralogy/chemistry is discussed, using the Moon and Mars as examples. The mass-velocity distribution of the impactors is the same or very similar in the inner part of the solar system, and on Jupiter and Saturn. Ancient impact rates are comparable. The time dependance of the impact rate in the Earth-Moon system, and by analogy at the other terrestrial-type planets, suggests a smooth rapid decay during the first billion years of solar system history rather than a peak in impact rate (cataclysm) 4 billion years ago. The reconstruction of martian impact chronology, shows that Mars was geologically active in its early times essentially.
Author (ESA)

N82-26102# Max-Planck-Institut fuer Chemie, Mainz (West Germany). Otto-Hahn Inst.
CHEMISTRY AND ACCRETION HISTORY OF THE EARTH AND THE INNER PLANETS **c91**
H. Waenke *In* ESA The Solar System and its Exploration Nov. 1981 p 141-150 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

The chemical composition of the inner planets and petrological type 1 carbonaceous chondrites (C1) are compared. The Earth, the Moon and eucrite parent asteroid are depleted in moderately volatile and volatile elements compared to C1 chondrites. The Earth mantle and the Moon are slightly enriched in refractory lithophile elements and in magnesium. This might be due to normalization to Si, with the Earth mantle and Moon being depleted in Si which partly entered the Earth's core in metallic form. The depletion of V, Cr, and Mn in the mantle is explained by their partial removal into the core. The similar depletion of these elements of the Moon indicates the strong genetic relationship of Earth and Moon. The compositional trends observed for the mantle indicate an inhomogeneous accretion of the Earth from a fully reduced volatile free component A followed by a highly oxidized, volatiles-containing component B. Author (ESA)

N82-26103# Centre National de la Recherche Scientifique, Verrieres-le-Buisson (France). Service d'Aeronomie.
SPACE MISSIONS TO VENUS **c91**
J. L. Bertaux *In* ESA The Solar System and its Exploration Nov. 1981 p 151-156 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member

States, AU, CN and NO (+20% others)

Pioneer and Venera project achievements are summarized. The Venera spacecraft obtained temperature and pressure profiles down to the surface and measured the atmospheric bulk composition (CO2 96%, N2 4%). They took the first photographs of the surface showing rocks. They analyzed the surface, using a gamma ray spectrometer, and observed lightning. Mariner 10 took UV pictures of cloud cover, confirming the general 4 days rotation originally inferred from ground based observations. The surface was mapped by a radar altimeter. Author (ESA)

N82-26104*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

PHYSICS OF PLANETARY ATMOSPHERE AND IONOSPHERES **c91**

Siegfried J. Bauer *In* ESA The Solar System and its Exploration Nov. 1981 p 157-160 refs (For primary document see N82-26087 16-88)

Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

The traditional atmospheric regions, the distinction between homosphere and heterosphere, and changing atmospheric composition are discussed. The validity of the barometric law based on a Maxwell-Boltzmann distribution, for the major part of a planetary atmosphere and its breakdown in the exosphere due to escape of atmospheric particles is considered. The formation and maintenance of photochemical and diffusion-controlled ionospheric layers are treated. Their applicability to planetary ionospheres is dealt with. The spatial extent of magnetic and nonmagnetic planet ionospheres is investigated. Thermal and nonthermal processes responsible for the mass loss of planetary atmospheres are surveyed. Author (ESA)

N82-26105*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE ATMOSPHERES OF JUPITER, SATURN AND TITAN **c91**

Siegfried J. Bauer *In* ESA The Solar System and its Exploration Nov. 1981 p 161-163 refs (For primary document see N82-26087 16-88)

Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

Spacecraft observations of Jupiter, Saturn and Titan are discussed. The relative abundance of helium differs for the two planets, being about 10% for Jupiter and 6% for Saturn. These ratios are consistent with the same age of the planets and internal heat fluxes as measured; Saturn emits IR at about 2.5 to 3 times the incident solar flux, while Jupiter emits about 1.8 to 2 times. Jupiter's zonal jet system is more stable than the colorful markings on the planet. Anticyclonic and cyclonic motions are observed, with the Great Red Spot being the most prominent anticyclonic system. Compared with Jupiter, peak zonal velocities on Saturn are three times higher, reaching two-thirds of the speed of sound near the equator. The zonal jets are much wider and do not have any clear relation to the banded structure. Saturn lacks large oval spots, although features of diameter 1000 km are more abundant than on Jupiter. Titan's atmosphere consists of nitrogen (82%) methane (6%) H2 (0.2%) and, possibly, Argon (12%) Author (ESA)

N82-26106# Innsbruck Univ. (Austria). Inst. fuer Meteorologie und Geophysik.

OPTICAL AND INFRARED MEASUREMENTS ON PLANETARY ATMOSPHERES **c91**

H.-J. Bolle *In* ESA The Solar System and its Exploration Nov. 1981 p 165-172 refs (For primary document see N82-26087 16-88)

Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

Imaging, photometric and radiometric techniques are discussed. The ability of these methods to determine atmospheric structure, composition and dynamical features is illustrated. Analysis of Jupiter's backscattered solar radiation shows that the atmosphere in the 100 mb to 5 bar region contains one cloud layer between 3 to 5 bar containing H20 and NH4, and a layer at 400 to 700 mb, consisting of NH3. Polarization and spectral measurements on Venus show that cloud consists mainly (85%) of H2504. Radiometric absorption measurements on Jupiter reveal a warm equatorial belt surrounded by cold zones reflecting the visible banded structure. Planetary heat budgets can be derived from optical radiance measurements. An interferometer spectrometer monitored the thermal effect of a large Martian sandstorm. The Voyager mission used emission spectroscopy to identify and quantify gas constituents in the atmospheres of Jupiter, Saturn and Titan. Author (ESA)

N82-26107# Technische Universitaet, Munich (West Germany). Inst. fuer Mineralogie.

THE MOON: ITS STRUCTURE, ORIGIN, AND DEVELOPMENT **c91**

Alan B. Binder *In* ESA The Solar System and its Exploration Nov. 1981 p 175-178 refs (For primary document see N82-26087 16-88)

Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

Apollo program findings are summarized. The Moon is a differentiated body whose bulk major oxide composition is very similar to that of the terrestrial mantle, indicating a close genetic tie between the Earth and the Moon. The initial lunar differentiation produced a massive feldspathic crust which then underwent considerable tectonic, impact, chemical, and petrological modification, an olivine-rich mantle, and possibly a small Fe-FeS core. While the Moon is a simpler body than the Earth, the Moon has a very complex history and is petrologically and structurally complicated. Author (ESA)

N82-26108# Technische Hochschule, Vienna (Austria). Inst. of Analytical Chemistry.

JUPITER'S MOONS **c91**

W. Kiesl *In* ESA The Solar System and its Exploration Nov. 1981 p 179-185 refs (For primary document see N82-26087 16-88)

Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

Models of the structure and chemical composition of Jupiter's moons and outer satellites are presented. Their origin and evolution are inferred from color photographs and direct measurements. Sulfur is proposed as the driving mechanism of Io's volcanic activity, either as element concentrated on the surface of the satellite and reworked to deeper regions through plate tectonics, or as S02, forced by artesian pressure to explode into an ice fog through faults. Ganymede consists mainly of silicates and water. Models of melting and solidification do not agree with Voyager observation. Accretian models predict central temperatures of 3000 K for Callisto. The regular satellites formed through homogeneous accretion of hydrous silicates.

Author (ESA)

N82-26109# Graz Univ. (Austria). Research Center.

THE VENUS ORBITING IMAGING RADAR (VOIR) MISSION **c12**

Franz W. Leberl *In* ESA The Solar System and its Exploration Nov. 1981 p 189-197 refs (For primary document see N82-26087 16-88)

Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States AU, CN and NO (+20% others)

Knowledge of the surface of Venus, the VOIR mission plan, and imaging side-looking radar (SLR) are discussed. Earth radar images show that Maxwell Mons, at 11.1 km, is the highest feature, Diana Chasma the lowest. The VOIR satellite will use an SLR from an altitude of 250 km. Global data at 600 m per line pair and high resolution, 150 m, data will be collected. The look angle will be 50 deg off nadir in order to compromise between accentuation of gentle relief (with lack of layover distortion) and accentuation of backscatter differences of materials or roughnesses (with lack of shadowing). Simulation of VOIR imagery, using Seasat data and experience with Apollo 17 lunar sounder suggest that VOIR data will be comparable to, or superior to that obtained for other terrestrial planets. Author (ESA)

N82-26110# Max-Planck-Institut fuer Kernphysik, Heidelberg (West Germany).

INTERPLANETARY DUST: SOURCES, SINKS AND DYNAMICS **c90**

H. Fechtig *In* ESA The Solar System and its Exploration Nov. 1981 p 203-210 refs (For primary document see N82-26087 16-88)

Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

Lunar microcrater and in situ measurement data on the dynamics of interplanetary dust are summarized. Lunar microcrater studies and simulation experiments produce flux diagrams for the dust at 1 AU in the mass range between 10 to the minus 17th power and 10 to the minus 3rd power g. Microcrater morphologies prove the existence of low density particles. In situ experiments reveal that 90% of the particles are on direct orbits around the Sun at 20 to 25 km/sec heliocentric velocities (apex particles) and 10% at a speed of 50 km/sec (antiapex particles). The antiapex particles are low-density. A submicron-sized particle stream comes from the direction of the Sun. Comets provide most of the particles in the solar system dust cloud. Due to the Poynting-Robertson effect, the young low density cometary dust particles spiral towards the Sun. When these particles are old and on quasicircular orbits around the Sun, their densities could be > 1g/cu cm. Author (ESA)

N82-26111# Centre National de la Recherche Scientifique, Verrieres-le-Buisson (France). Service d'Aeronomie.

AERONOMICAL PROCESSES IN COMETARY COMAE **c91**

Michel Festou *In* ESA The Solar System and its Exploration Nov. 1981 p 213-219 refs (For primary document see N82-26087 16-88)

Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

Analysis of comet nuclei through the emissions produced by their volatile parts is discussed. High spectral resolution observations are used to study the emission mechanism of the light, neutral-neutral collisions and to measure line widths. Accurate wavelength measurements are needed to identify fluorescence transitions. Examination of spatial distributions in monochromatic images shows whether the emitter is neutral or an ion. Intensity profiles reflect the nature of the chain linking the primary molecules escaping the circumnuclear region and the observed species. Production rates of parent molecules can be derived from the production rates of dissociation products of a given molecule. The main production processes are photodissociation (the most efficient) photoionization, electron recombination, and gas phase reactions. Author (ESA)

N82-26112# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.

THE GIOTTO PROJECT: A FAST FLYBY OF HALLEY'S COMET **c12**

R. Reinhard *In* ESA The Solar System and its Exploration Nov. 1981 p 221-227 (For primary document see N82-26087 16-88)

Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

The Giotto mission objectives and scientific payload are described. Giotto will investigate the elemental and isotopic composition of the volatile components in the cometary coma, in particular the parent molecules. It will characterize the physical processes and chemical reactions that occur in the cometary atmosphere and ionosphere and determine the elemental and isotopic composition of the cometary dust particles. It will measure the total gas production rate and the dust flux and size/mass distribution, and derive the dust-to-gas ratio; it will study the macroscopic system of plasma flows resulting from the interaction between the cometary and the solar wind plasma. It will provide images of the comet nucleus with a resolution down to 50 m (from which the size and rotation of the nucleus can be deduced and its mass estimated). Author (ESA)

N82-26113# Centre National de la Recherche Scientifique, Verrieres-le-Buisson (France). Lab. de Physique Stellaire et Planetaire.

INFRARED SOUNDING OF HALLEY'S COMET FROM THE FLYBY VENERA HALLEY PROBES **c12**

J. F. Crifo *In* ESA The Solar System and its Exploration Nov. 1981 p 229-244 refs (For primary document see N82-26087 16-88)

(Contract CNES-81-202)

Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

A far IR instrument for sounding the innermost regions of Halley's comet is described. It includes two spectroscopic channels with a resolution lambda/Delta lambda = 50 for analyzing the chemical composition of the gas and dust phases, and an image spatial frequency modulating channel for measuring nucleus size, temperature and emissivity. It will study the thermodynamic budget of the nucleus. It will provide information on the crystalline structure of the components of grains in the inner coma and on the minerals and ices in the nucleus. It will identify the most abundant molecules released by the nucleus and measure their production rate with negligible risk of environmental contamination. Author (ESA)

N82-26114# Oesterreichische Akademie der Wissenschaften, Vienna. Inst. for Space Research.

MAGNETIC FIELD MEASUREMENTS ON BOARD VENERA 13, VENERA 14 AND VENERA HALLEY **c35**

R. Schmidt and K. Schwingenschuh *In* ESA The Solar System and its Exploration Nov. 1981 p 245-247 refs (For primary document see N82-26087 16-88)

Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

The technical specifications and experimental objectives of Spacelab and Venera magnetometers are outlined. The spacelab magnetometer has a sensitivity range of + or - 150,000 gamma, providing data on the size and orientation of magnetic field vectors throughout the mission. The Venera 13 and 14 instruments sensitivity range is + or - 100 nT, with 0.2 nt resolution. They will map the interplanetary field macrostructure, give shock wave information, and indicate changes in the interplanetary magnetic field near Earth and Venus. One Halley probe will cross the shock front produced by the comet, the other may traverse the tail. As the spacecraft approach the comet the periods between data transfer will be reduced, but the internal data sampling rate will not change. After recognition of a shock by a detection algorithm, data transfer to the memory is stopped, allowing the memory to represent the turbulent magnetic field. Author (ESA)

N82-26115# European Space Agency, Paris (France).

OUTLOOK ON FUTURE MISSIONS **c12**

G. P. Haskell *In its* The Solar System and its Exploration Nov. 1981 p 251-255 ref (For primary document see N82-26087 16-88)

Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU CN and NO (+20% others)

European capabilities and limitations with regard to planetary space missions are discussed. The performance of the Ariane launcher is described. The development of ground-based and space equipment needed for planetary missions is reviewed. The weight of payloads carried into geosynchronous transfer orbit by Ariane will increase from 1700 to 5500 kg. Apart from electric power supplies, present designs are suitable for planetary orbiters, deep space probes and flyby vehicles. Chemical and solar powered secondary propulsion systems are being developed. Projects concerning spaceborne astronomy, spectronomy, and solar observation are summarized, as are Mars and Moon missions. Author (ESA)

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N82-26116*# Massachusetts Inst. of Tech., Cambridge. Dept. of Physics and Center for Space Research.

EVOLUTION OF X-RAY ASTRONOMY

Bruno Rossi 1981 33 p refs Presented at the Plasma Astrophys. Course and Workshop, Varenna, Italy, 27 Aug. - 7 Sep. 1981

(Contract NAS5-24441)

(NASA-CR-168703; NAS 1.26:168703) Avail: NTIS HC A03/MF A01 CSCL 03A

The evolution of X-ray astronomy up to the launching of the Einstein observatory is presented. The evaluation proceeded through the following major steps: (1) discovery of an extrasolar

X-ray source, Sco X-1, orders of magnitude stronger than astronomers believed might exist; (2) identification of a strong X-ray source with the Crab Nebula; (3) identification of Sco X-1 with a faint, peculiar optical object; (4) demonstration that X-ray stars are binary systems, each consisting of a collapsed object accreting matter from an ordinary star; (5) discovery of X-ray bursts; (6) discovery of exceedingly strong X-ray emission from active galaxies, quasars and clusters of galaxies; (7) demonstration that the principal X-ray source is a hot gas filling the space between galaxies. E.A.K.

N82-26117*# Louisiana State Univ., Baton Rouge. Dept. of Physics and Astronomy.

ON THE NATURE OF UPSILON SAGITTARII

D. Schoenberner and J. S. Drilling [1982] 11 p refs (Grant NAG5-71; NSF AST-80-18766; AF-AFOSR-3218-77; AF-AFOSR-0192-82)

(NASA-CR-168987; NAS 1.26:168987) Avail: NTIS HC A02/MF A01 CSCL 03A

An explanation for the nature and evolution of the extremely hydrogen deficient binary Upsilon Sagittarii which is consistent with all observational and theoretical facts. First, the system goes through a Case B mass exchange in which most of the hydrogen rich envelope of a massive primary (5 to 14 solar masses) is lost. The remaining envelope still contains about 50% hydrogen (by number), but is now of negligible mass, so that the star evolves like a pure helium star. If its mass is between 1 and 2 solar masses the star reaches low surface temperatures and becomes a supergiant before the onset of carbon burning. This star (the original primary) then fills its Roche lobe a second time, spilling its now helium rich envelope over onto the secondary (Case BB mass exchange). It is argued that Upsilon Sagrittarii is in this state at the present time, and that the visible star is an evolved helium star of about 1 solar mass with a degenerate carbon-oxygen core and a helium burning shell which provides the high luminosity. Author

N82-26118# Army Engineer Topographic Labs., Fort Belvoir, Va.

LONGITUDE DETERMINATION BY TWO DIFFERENT STARS OBSERVED AT THE SAME ALTITUDE EAST AND WEST OF THE MERIDIAN

Angel A. Baldini 14 Mar. 1981 10 p refs (AD-A109329; ETL-R030) Avail: NTIS HC A02/MF A01 CSCL 03/1

The determination of time by east and west observation of the zenith distance of a star near the prime vertical shows discrepancies as much as 2 seconds of time. A new method with higher accuracy has been developed. It is based on observation of an individual pair of stars. The observation of each star (one east, the other west of the meridian) consists of determinimg the instant of time at which it crosses a fixed preselected unknown zenith in order to determine the circumstances when greatest accuracy can be expected. GRA

N82-26119# European Space Agency, Paris (France).

ULTRAVIOLET STELLAR CLASSIFICATION

A. Heck, comp. and B. Battrick, comp. Mar. 1982 140 p refs Proc. of Workshop, Vilspa, Spain, 26-28 Oct. 1981 (ESA-SP-182; ISSN-0379-6566) Avail: NTIS HC A07/MF A01

Available UV data and its impact on stellar classification were discussed. For individual titles, see N82-26120 through N82-26130.

N82-26120# Liege Univ. (Belgium). Dept. d'Astrophysique.

ULTRAVIOLET CLASSIFICATION FROM THE S2/68 EXPERIMENT ON BOARD THE TD-1A SATELLITE

A. Cucchiaro *In* ESA Ultraviolet Stellar Classification Mar. 1982 p 1-7 refs (For primary document see N82-26119 16-89)

Avail: NTIS HC A07/MF A01

An atlas of UV stellar spectra, with a morphological classification system, for wavelengths from 1350 to 2740 A is described and the classification procedure is outlined. The atlas is in three parts: spectra in order of advancing spectral type; extreme classes in order to illustrate the luminosity effect; and peculiar spectra. For classification, stars are first visually divided into B or A-F type. The B stars are then divided into seven homogeneous spectral groups (each divided into three subgroups) and A-F stars into four homogeneous groups by applying ultraviolet plus either temperature or luminosity criteria. The classification correlates well with photometric and spectroscopic values. Author (ESA)

N82-26121# Observatoire de Strasbourg (France). Centre de donnees Stellaires.

ON THE RELATION BETWEEN SPECTRAL CLASSIFICATION IN THE OPTICAL AND ULTRAVIOLET REGIONS

M. Jaschek and C. Jaschek *In* ESA Ultraviolet Stellar Classification Mar. 1982 p 9-13 (For primary document see N82-26119 16-89)

Avail: NTIS HC A07/MF A01

The establishment of a frame of reference for stellar classification in the UV, independent of temperature, surface gravity, and chemical composition. Of the 1900 spectra obtained by TD-1, 94% can be classified identically as abnormal or normal in the optical and UV regions, at 37 A spectral resolution (= 1850 A/mm dispersion in the optical). At 1.8 A spectral resolution, 17% of stars classified as normal by the MK method are abnormal in the UV. Author (ESA)

N82-26122# Groningen Rijksuniversiteit (Netherlands). Dept. of Space Research.

SPECTRAL CLASSIFICATION AND EXTINCTION USING ANS SATELLITE ULTRAVIOLET PHOTOMETRY

P. R. Wesselius *In* ESA Ultraviolet Stellar Classification Mar. 1982 p 15-23 refs (For primary document see N82-26119 16-89)

Avail: NTIS HC A07/MF A01

Performance of satellite-borne experiments for studying UV extinction and defining a finer spectral grid than the ground based spectroscopic one is summarized. In small regions (a few tenths of a square degree) local extinction can deviate significantly from galactic average. Dereddening a much reddened field star, using a general extinction law, gives very uncertain intrinsic colors. Physical associations of stars seen behind single dust clouds can be dereddened accurately if the local extinction law has an intrinsic spread much smaller than the average. Reddening-free parameters are strongly affected by extinction. A finer classification of early type stars cannot be achieved, although stars having $E(B - V) < 0.3$ can be classified as well as with the MK system provided it is known that they have luminosity class 4 or 5. For certain homogeneous groups of early stars located behind single dust clouds, local extinction can be obtained by iteration. Temperatures of AO to KO stars can be determined accurately. Author (ESA)

N82-26123*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

IUE ULTRAVIOLET SPECTRAL ATLAS

C. C. Wu, A. Boggess, R. C. Bohlin, A. V. Holm, F. H. Schiffer, and B. E. Turnrose *In* ESA Ultraviolet Stellar Classification Classification Mar. 1982 p 25-54 (For primary document see N82-26119 16-89)

Avail: NTIS HC A07/MF A01 CSCL 03A

Low dispersion trailed spectra for a group of normal stars, with sample plot and flux tables, are presented. Exposure times are computed assuming 21.4 and 20.5 arcsec aperture lengths. Author (ESA)

N82-26124# European Space Agency, Madrid (Spain). IUE Obs.

IUE OBSERVATION STATISTICS

A. Heck *In its* Ultraviolet Stellar Classification Mar. 1982 p 55-79 (For primary document see N82-26119 16-89)

Avail: NTIS HC A04/MF A01

Merged data from the two IUE ground stations, grouped according to the NASA-ESA-SERC classification scheme are presented. Distribution by camera and dispersion of all the spectra (26,228) recorded by the standard IUE cameras as well as a distribution where only different objects are considered in each box (a total of 15,829 nonredundant observations) are given. Of 672 stars, only 148 were observed in two spectral ranges, while for 364 stars, no spectrum was previously available. A list of

standard UV stars is published, together with their IUE observational status e.g., observed at high or low dispersion.
Author (ESA)

N82-26125# European Space Agency, Madrid (Spain). IUE Obs.
THE VILSPA, SPAIN IUE DATA BANK
P. Benvenuti *In its* Ultraviolet Stellar Classification Mar. 1982 p 81-83 (For primary document see N82-26119 16-89)
Avail: NTIS HC A07/MF A01

The IUE information dissemination network is described. Three data banks (at the World Data Center, Rutherford and Appleton Laboratory, England and Vilspa, Spain ground station) contain all IUE spectra except those for the most recent six month period. The updated log appears in NASA and ESA newsletters, and an annual cumulative log is available on microfiche. About 250 spectra were retrieved per month in 1981, compared with 140 in 1980. Peak retrieval capability is 650 per month.
Author (ESA)

N82-26126# European Southern Observatory, Santiago (Chile).
A NEAR INFRARED ATLAS OF SOUTHERN MK STANDARDS
A. C. Danks and M. Dennefeld (Inst. d'Astrophysique, Paris) *In* ESA Ultraviolet Stellar Classification Mar. 1982 p 85-89 refs (For primary document see N82-26119 16-89)
Avail: NTIS HC A07/MF A01

The advantages of the near IR for classifying late stars are described. In order to provide reference stars for far red observations of a reticon detector for low dispersion Cassegrain spectroscopy, 160 stars of spectral type O to M, luminosity types 1.3 and 5 were examined. Observations covered the wavelength range from 5800 to 10,200 A. The O region is relatively clean and free of major line blanketing effects. Quantitative classification by measuring relative line intensities, spectral gradients, or fitting black bodies is promising. Spectra of peculiar stars (WN5 and C8 type) are well defined, indicating the usefulness of carbon and helium spectra for classification, especially of cool stars.
Author (ESA)

N82-26127# Royal Observatory, Edinburgh (Scotland).
UV SPECTROPHOTOMETRY OF EARLY-TYPE STARS
K. Nandy *In* ESA Ultraviolet Stellar Classification Mar. 1982 p 91-100 refs (For primary document see N82-26119 16-89)
Avail: NTIS HC A07/MF A01

Spectral classification of early stars from spectrophotometry of low dispersion IUE spectra is discussed. An iterative classification method based on spectral energy distribution, which allows for interstellar extinction variability and corrects colors for interstellar reddening, is proposed. As a first approximation, fluxes are dereddened, using the strength of the 2200 A feature as a reddening indicator and the mean relation between (A2200 - AV) and E(B-V). Two very broad parameters, X1 and X2 are formed. The mean relation between X1 and X2 is: X2 = 0.37 + 1.2 X 1. If the extinction curves for individual stars differ from this mean, their location on X1 and X2 plots is considerably displaced from the sequence represented by the equation. The X1 and X2 parameters of three Perseus stars are plotted. This shows that stars can be grouped according to effective temperature, surface gravity, and deviation from the mean extinction curve, using observed flux distributions over the IUE range together with V magnitudes.
Author (ESA)

N82-26128# Observatoire de Paris (France).
STELLAR UV CLASSIFICATION: SOME CRITICAL REMARKS AND EXAMPLES TAKEN FROM A5 TO B5 STARS
F. Praderie *In* ESA Ultraviolet Stellar Classification Mar. 1982 p 101-114 refs (For primary document see N82-26119 16-89)
Avail: NTIS HC A07/MF A01

Parameters needed to classify normal stars, parameters which govern parts of the UV spectrum, and ways of distinguishing abnormal stars are reviewed. The use of photospheric spectral features for UV classification is advocated because the major part of the energy radiating from the star originates from the photosphere. Temperature can be obtained by observing longwave flux in the black body curve. Observational criteria can be derived from continua by connecting the UV to the visible spectrum, and by producing pure UV indices. The first method is well suited to A5 to B5 stars. Classification from UV lines should select local thermodynamic equilibrium photospheric lines such that (line center absorption coefficient)/(continuum opacity at the line (Kc)) is small, and Kc not much > continuum opacity at 5000 A. Analysis of AP to BP stars shows that temperature and opacity effects are mixed in the UV, prohibiting the use of pure UV indices as temperature indicators.
Author (ESA)

N82-26129# Heidelberg Univ. (West Germany). Inst. fuer Theoretische Astrophysik.
MISCELLANEOUS REMARKS ON THEORETICAL ASPECTS OF UV STELLAR CLASSIFICATION
B. Baschek *In* ESA Ultraviolet Stellar Classification Mar. 1982 p 115-120 refs Sponsored by Deutsche Forschungsmeinschaft (For primary document see N82-26119 16-89)
Avail: NTIS HC A07/MF A01

Stellar atmosphere parameters and the importance of spectral resolution for stellar classification are discussed and analyses of blue halo stars are summarized. A UV classification scheme, involving effective temperature, surface gravity, an abundance parameter (given variations in He, CNO, or metal abundance) and peculiarity affixes similar to the MK system, is advocated. Spectral resolution of 1 A at 1500 A can be achieved, using high dispersion IUE spectra. Analysis of the OB subdwarf HD 149382 shows the importance of high dispersion spectra compared with the 6A low dispersion observations. Anomalies such as silicon underabundance by a factor > 40,000, are clearly revealed. Lack of atomic data (line identification lists, oscillator strengths) limits line identification, so quantitative calibration, especially at low reduction, is difficult unless the classification features are dominated by a very few, very strong, lines.
Author (ESA)

N82-26130*# Washington Univ., Seattle. Dept. of Astronomy.
SUGGESTED UV SPECTRAL CLASSIFICATION CRITERIA FOR A STARS
E. Boehm-Vitense *In* ESA Ultraviolet Stellar Classification Mar. 1982 p 121-130 refs (For primary document see N82-26119 16-89)
(Grant NSG-5398)
Avail: NTIS HC A07/MF A01

Criteria for determining effective temperature and electron density independently of abundances, for A, late B, and F stars are given. Comparison of IUE data with standard classification techniques, shows that for late B and A stars, temperature classification by UV spectra is more sensitive than classification using visual spectra. The long wavelength wing of the Lyman is recommended for these stars. For A and F stars, the ratio of the Mg (2580 A) and Mg+ (2800A) resonance lines gives a good temperature/electron density (ne) criterion which is nearly independent of metal abundance (Z). The Sil discontinuities give an excellent temperature classification for A and F stars, but it is dependent on Z and ne. If the absolute intensities of either of the Mg lines are added to the criteria, three classification criteria for a three dimensional classification, according to temperature, ne and Z, are obtained.
Author (ESA)

N82-26059*# Colorado Univ., Boulder. Lab. for Atmospheric and Space Physics.
X-RAY SPECTROSCOPIC OBSERVATIONS AND MODELING OF SUPERNOVA REMNANTS
J. Michael Shull *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 107-117 refs Prepared in cooperation with the Joint Inst. for Lab. Astrophysics (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 03A

N82-26064*# Institute of Space and Astronautical Science, Tokyo (Japan).
X-RAY ASTRONOMY PROGRAM IN JAPAN
Yasuo Tanaka *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1982 p 219-226 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 03A

N82-26065*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
THE LAMAR: A HIGH THROUGHPUT X-RAY ASTRONOMY FACILITY FOR A MODERATE COST MISSION
Paul Gorenstein and Daniel Schwartz *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 227-269 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 03A

N82-26066*# Lockheed Missiles and Space Co., Palo Alto, Calif.
A WOLTER TYPE I LAMAR
R. C. Catura and E. G. Joki *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 271-287 refs (For primary document see N82-26055 16-88)
(Contracts NAS5-23563; NAS5-26090)
Avail: NTIS HC A99/MF A01 CSCL 03A

N82-26072*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
HARD X-RAY IMAGING FROM EXPLORER
Jonathan E. Grindlay and S. S. Murray *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 349-366 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 03A

N82-26073*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
THE STELLAR CORONAL X-RAY EXPLORER: STCOEX
Giuseppe S. Vaiana *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 371-377 refs (For primary document see N82-26055 16-88)
(Grant NsG-7176)
Avail: NTIS HC A99/MF A01 CSCL 03A

N82-26077*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
BROAD BAND X-RAY TELESCOPE (BBXRT)
Peter J. Serlemitsos *In its* X-ray Astronomy in the 1980's Nov. 1981 p 441-460 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 03A

N82-26078*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOME OBSERVATIONAL TESTS OF X-RAY PULSAR EMISSION MODELS
Peter Meszaros (Maryland Univ., College Park) *In its* X-ray Astronomy in the 1980's Nov. 1981 p 461-469 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 03A

N82-26084*# California Univ., San Diego. Center for Astrophysics and Space Sciences.
SPECTROSCOPY IN THE 10 keV TO 10 MeV RANGE
James L. Matteson *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 549-566 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 03A

N82-26085*# Columbia Univ., New York. Astrophysics Lab.
SPECTROSCOPY FROM 2 TO 200 keV
David J. Helfand, Gary A. Chanan, Robert Novick, Crawford J. MacCallum (Sandia Lab., Albuquerque), and Marvin Leventhal (Bell Telephone Labs.) *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 567-598 refs (For primary document see N82-26055 16-88)
(Contract NAS5-26041)
(CONTRIB-216) Avail: NTIS HC A99/MF A01 CSCL 03A

N82-26086*# California Univ., San Diego.
HARD X-RAY ASTROPHYSICS
Richard E. Rothschild *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 599-620 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 03A

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N82-26131# Max-Planck-Institut fuer Kernphysik, Heidelberg (West Germany).
PHYSICAL AND CHEMICAL CHARACTERISTICS OF INTERPLANETARY DUST PARTICLES. MEASUREMENTS BY THE MICROMETEOROID EXPERIMENT ON BOARD HELIOS Final Report, Jun. 1981
Eberhard Gruen Bonn Bundesministerium fuer Forschung und Technologie Aug. 1981 194 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-81-034; ISSN-0170-1339) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 35.90

The micrometeoroid experiment onboard Helios allowed the measurement of physical and chemical characteristics of interplanetary dust particles between 0.3AU and 1AU solar distance. During the first 10 orbits of Helios 1,235 impacts of micrometeoroids were detected. Eighty-three particles were registered by the ecliptic sensor and 152 by the south sensor. Most of the particles detected by the ecliptic sensor impacted the sensor from the apex direction. The particles observed by the south impacted the sensor from all directions with a slightly enhanced flux from solar direction. The average of impact speed of particles was 15 km/s. From 1AU to 0.3AU, the observed particle flux increased by a factor 5 to 10. The orbits of the registered particles are highly eccentric, e> or approximately 0.6, and some are hyperbolic. The mass spectra measured upon impact allow the classification of the chondritic and iron rich particles. N.W.

N82-26132# Los Alamos Scientific Lab., N. Mex.
LOS ALAMOS GEOSTATIONARY ORBIT SYNOPTIC DATA SET: A COMPILATION OF ENERGETIC PARTICLE DATA
D. N. Baker, P. R. Higbie, R. D. Belian, W. P. Aiello, and E. W. Hones, Jr. Aug. 1981 213 p refs
(Contract W-7405-eng-36)
(DE82-004178; LA-8843) Avail: NTIS HC A10/MF A01

Energetic electron (30 to 2000 keV) and proton (145 keV to 150 MeV) measurements made by Los Alamos National Laboratory sensors at geostationary orbit 6.6 R/sub E/ are summarized. The data are plotted in terms of daily average spectra, 3-h local time averages, and in a variety of statistical formats. The data summarize conditions from mid-1976 through 1978 (S/C 1976-059) and from early 1977 through 1978 (S/C 1977-007). The compilations correspond to measurements at 350W, 700W, and 1350W geographic longitude and, thus, are indicative of conditions at 90, 110, and 4.80 geomagnetic latitude, respectively. Most of this report is comprised of data plots that are organized according to Carrington solar rotations so that the data can be easily compared to solar rotation-dependent interplanetary data. As shown in prior studies, variations in solar wind conditions modulate particle intensity within the terrestrial magnetosphere. The effects of these variations are demonstrated and discussed. Potential uses of the Synoptic Data Set by the scientific and applications-oriented communities are also discussed. DOE

N82-26133# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
TRANSITION FROM THE DUSTY PLASMA STATE TO THE PLANETESIMAL STATE OF THE EARLY SOLAR SYSTEM
P. Carlqvist and H. Alfven Dec. 1981 26 p refs
(TRITA-EPP-81-09; ISSN-0348-7539) Avail: NTIS HC A03/MF A01

The agreement to within a few percent between the theoretically predicted cosmogonic shadow effect and observations of large scale structures of the Saturnian rings and the asteroidal region is discussed. Although the theory has to be modified, its observationally confirmed core remains valid. A transformation from the fixed coordinate system to a system which corotates with the plasma shows that in the latter system the orbits of the condensed particles contain a number of cusps where the

condensed material is focused and stays for a comparatively long time. As a result, radiative cooling decreases the temperature, possibly by one or several orders of magnitude. This makes the cusps form small cold high density regions in a plasma, the major part of which is hot and dilute. Author (ESA)

N82-26060*# Massachusetts Inst. of Tech., Cambridge. Dept. of Physics.
INTERSTELLAR, INTRACLUSTER AND SUPERCLUSTER GAS
Lennox L. Cowie *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 119-132 refs (For primary document see N82-26055 16-88)
(Grants NAGw-208; NsG-7643; NGL-22-009-638)
Avail: NTIS HC A99/MF A01 CSCL 03B

N82-26061*# Institute of Astronomy, Cambridge (England).
X-RAY EMISSION FROM GALAXIES AND THE UNIVERSE
A. C. Fabian *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 133-141 refs (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 03B

N82-26088# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
THE PLASMA PHASE OF THE EVOLUTION OF THE SOLAR SYSTEM
H. Alfven *In* ESA The Solar System and its Exploration Nov. 1981 p 3-10 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

N82-26094# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
THE EARLY EVOLUTION OF PLANETS
H. Alfven *In* ESA The Solar System and its Exploration Nov. 1981 p 65-73 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

N82-26098# Academy of Sciences (USSR), Moscow. O. Y. Schmidt Inst. of Physics of the Earth.
FORMATION OF PLANETS
E. L. Ruskol *In* ESA The Solar System and its Exploration Nov. 1981 p 107-113 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

N82-26110# Max-Planck-Institut fuer Kernphysik, Heidelberg (West Germany).
INTERPLANETARY DUST: SOURCES, SINKS AND DYNAMICS
H. Fechtig *In* ESA The Solar System and its Exploration Nov. 1981 p 203-210 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N82-26134*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VIBRATIONAL-ROTATIONAL SPECTROSCOPY FOR PLANETARY ATMOSPHERES, VOLUME 2
Michael J. Mumma, ed., Kenneth Fox, ed. (Tennessee Univ.), and John Hornstein, ed. (Computer Sciences Corp.) Apr. 1982 242 p refs Proceedings of Workshop held at Annapolis, Md., 17-19 Mar. 1980
(NASA-CP-2223-Vol-2; NAS 1.55:2223) Avail: NTIS HC A11/MF A01 CSCL 03B

The planetary atmospheres are investigated for their chemical composition. Hydrogen, methane, ethylene, acetylene, and ethane were studied. Various spectroscopic investigations were made. For individual titles, see N82-26135 through N82-26151.

N82-26135*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
H2 AND HD SPECTROSCOPIC STATUS
Jack S. Margolis *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 2 Apr. 1982 p 431-437 refs (For primary document see N82-26134 16-91)
Avail: NTIS HC A11/MF A01 CSCL 03B

HD spectra was studied in the UV about as thoroughly as those of H2. The vibration-rotation line positions are known. However, the theory does not do well in calculating the absorption strengths. These tend to be stronger than the quadrupole strengths for H2 and so more lines were measured. The state of knowledge of the HD line positions of vibration-rotation constants is summarized. The HD absorption strength measurements are also summarized. A summary of absorption strengths for HD is tabulated. S.L.

N82-26136*# Pennsylvania State Univ., University Park.
COLLISION INDUCED SHARP FEATURES IN THE INFRARED SPECTRUM OF HD
R. M. Herman *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 2 Apr. 1982 p 439-447 refs (For primary document see N82-26134 16-91)
Avail: NTIS HC A11/MF A01 CSCL 03B

The collision induced spectra of HD and H2 are studied. Their application to the study of planetary (and planetary satellite) atmospheres is investigated. S.L.

N82-26137*# National Bureau of Standards, Washington, D.C.
FAR INFRARED SPECTRA OF H2 MIXTURES OF H2-CH4 AND H2-He
George Birnbaum *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 2 Apr. 1982 p 449-466 refs (For primary document see N82-26134 16-91)
Avail: NTIS HC A11/MF A01 CSCL 03B

Laboratory measurements of the far infrared absorption of H2 and of mixtures of H2 with CH4 and He are presented, and fits to the pure H2 spectra with a semiempirical line shape are described. Such results are needed in analyzing the thermal emission from the atmospheres of the outer planets. S.L.

N82-26138*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A REVIEW OF ACETYLENE, ETHYLENE AND ETHANE MOLECULAR SPECTROSCOPY FOR PLANETARY APPLICATIONS
W. C. Maguire *In its* Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 2 Apr. 1982 p 473-496 refs (For primary document see N82-26134 16-91)
Avail: NTIS HC A11/MF A01 CSCL 03B

Spectroscopic work in acetylene, ethylene and ethane, are of particular interest since the Voyager IRIS observations of Jupiter. Acetylene and ethane but not ethylene were observed in the Jovian spectrum. Two fundamental bands of the observed gases are used to determine the spatial distribution of these hydrocarbons on Jupiter and to illuminate the photochemistry of these species. The 100 to 1000 cm region is discussed and selected examples of current laboratory work are given. S.L.

N82-26139*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CURRENT STUDIES OF CH4 FROM 2.5 TO 7 MICRONS
Linda Brown *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 2 Apr. 1982 p 503-526 refs (For primary document see N82-26134 16-91)

Avail: NTIS HC A11/MF A01 CSCL 03B

The 3.5 micron region of methane was analyzed. The positions and strengths of approximately 9000 absorption lines in the region from 2400 to 3200 cm were measured. Spectra were obtained at a resolution of 0.1 cm using the Fourier transform spectrometer and at 0.02 cm resolution using the four passed grating spectrometer. The analysis of the 3.5 micron region required the use of spectra of CH4 in other regions, therefore the methane spectrum from 1200 to 4700 cm is indicated. The method used for the compilation of line lists is demonstrated. S.L.

N82-26140*# Tennessee Univ., Knoxville.

LINE INTENSITIES FROM BAND AND DIODE LASER MEASUREMENTS: NEUTRINO 4 OF CH4

Kenneth Fox *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 2 Apr. 1982 p 529-542 refs (For primary document see N82-26134 16-91)

Avail: NTIS HC A11/MF A01 CSCL 03B

The experimental data and theoretical work on the 7.7 micron band of methane are reviewed. This band is particularly relevant in studies of the atmospheres of Jupiter, Saturn and the other outer planets. Methane spectra taken from the infrared spectrometer (IRIS) aboard Voyager, and a temperature profile derived by inverting those data, both for hydrogen and methane are presented. S.L.

N82-26141*# Lowell Observatory, Flagstaff, Ariz. Planetary Research Center.

RANDOM WALKS WITH THE 6420- AND 6825-A FEATURES OF METHANE: LOST IN THE WILDERNESS

Barry L. Lutz *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 2 Apr. 1982 p 549-555 refs (For primary document see N82-26134 16-91)

(Grant NsG-7499)

Avail: NTIS HC A11/MF A01 CSCL 03B

A feature near 6420 A which appears in the spectra of Uranus and Neptune, and was recently detected in the spectrum of Titan is investigated. When originally identified, it was assigned to the pressure induced 4 to 0 band of molecular hydrogen. Not only did the wavelength agree--a small apparent shift was arm waved away, but when the feature was reduced using a dipole-induced strength, it gave results for H2 column densities consistent with best estimates for the sharp quadrupole lines. In studying the long path spectra of methane, that same feature was also present. A second similar problem exists with a Uranian feature--indeed, a general planetary feature centered near 6825 A. S.L.

N82-26142*# Arizona Univ., Tucson. Lunar and Planetary Lab.

CURRENT BAND MODEL STUDIES OF CH4 AT WAVELENGTHS LESS THAN 2.5 MICRONS

Uwe Fink *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 2 Apr. 1982 p 559-584 refs (For primary document see N82-26134 16-91)

(Grants NsG-7070; NsG-2349)

Avail: NTIS HC A11/MF A01 CSCL 03B

Band model theories are used to calculate the transmission of the methane spectrum. In a band model the monochromatic absorption coefficient over a small wavelength interval is replaced, and an average pressure coefficient is introduced. Two main types of band models were developed. The first is the 'regular' band model, in which the lines in a band are presumed evenly spaced; this is also called the Elsasser band model. In the second type of band model, the lines are randomly spaced; this is often referred to as the Mayor-Goody band model. The methane spectrum is sufficiently irregular that the second band model, the irregular band model, should apply. S.L.

N82-26143*# California Univ., Livermore. Lawrence Livermore Lab.

LONG-PATHLENGTH ABSORPTION SPECTROSCOPY OF CH4

Peter Silvaggio *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 2 Apr. 1982 p 585-595 refs (For primary document see N82-26134 16-91)

Avail: NTIS HC A11/MF A01 CSCL 03B

Infrared spectra of methane and ammonia are taken. The methane data base accumulated is described. The spectral region from 4,000 to 6,500 cm is covered at moderate resolution (0.15 cm), working at three temperatures (118, 191, and 272K), and with the (pressure - pathlength) product ranging over a factor of a thousand. Methane spectra broadened by hydrogen and helium have also been taken. Normalized spectra are stored on magnetic tapes, at a resolution slightly better than 0.25 cm. S.L.

N82-26144*# Lowell Observatory, Flagstaff, Ariz. Planetary Research Center.

CURRENT STUDIES OF CH3D: YE OLDE LINE DRIVE

Barry L. Lutz *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. Planetary Atmospheres, Vol. 2 Apr. 1982 p 599-610 refs (For primary document see N82-26134 16-91)

(Grant NsG-7499)

Avail: NTIS HC A11/MF A01 CSCL 03B

The CH3D molecule is an intermediate methane which has immediate importance in the study of the chemical composition of the outer planets. The deuterium present in the atmospheres of the giant planets is thought to be representative of the protosolar composition, a quantity of high interest to cosmogonists and to cosmologists. The values of D/H range from about .0002 in the interstellar medium to .00016 in sea water here on Earth. The CH3D molecule was examined as a probe of the D/H ratio. T.M.

N82-26145*# Ohio State Univ., Columbus.

SPECTRA OF AMMONIA

K. Narahari Rao *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 2 Apr. 1982 p 611-634 refs (For primary document see N82-26134 16-91)

Avail: NTIS HC A11/MF A01 CSCL 03B

Developments in the spectral analysis of ammonia are highlighted. Experimental techniques of diode laser spectroscopy were reviewed. It is shown that diode lasers give much better spectral resolution than even Fourier transform spectroscopy. T.M.

N82-26146*# Denver Univ., Colo. Dept. of Physics.

CURRENT STUDIES OF PH3

A. Goldman *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 2 Apr. 1982 p 635-653 refs (For primary document see N82-26134 16-91)

Avail: NTIS HC A11/MF A01 CSCL 03B

Recent quantitative spectroscopic studies of the PH3 fundamentals in the 10 and 4.5 micrometer regions resulted in line parameters applicable to spectral radiative models of planetary atmospheres. These include theoretical line parameters for the (nu sub 2 (A sub 1), nu sub 4 (E)) and (nu sub 1 (A sub 1), nu sub 3 (E)) regions, and empirical line parameters for the 2 nu sub 2, 2 nu sub 4 and nu sub 2 + nu sub 4 bands overlapping the (nu sub 1, nu sub 3) region. The theoretical line parameters were normalized to previously published values derived from low resolution spectra and are presented. T.M.

N82-26147*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

GASEOUS SO2 ON IO

John Pearl *In its* Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 2 Apr. 1982 p 657-630 (For primary document see N82-26134 16-91)

Avail: NTIS HC A11/MF A01 CSCL 03B

The evidence for SO2 on Io is discussed in terms of the thermal infrared and the near infrared. Recent and ongoing work in the ultraviolet is summarized. Charged particle measurements which support the presence of SO2 are presented. T.M.

N82-26148*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

ORGANIC CHEMISTRY IN TITAN'S ATMOSPHERE

Thomas Scattergood *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 2

Apr. 1982 p 679-691 refs (For primary document see N82-26134 16-91)
Avail: NTIS HC A11/MF A01 CSCL 03B

Laboratory photochemical simulations and other types of chemical simulations are discussed. The chemistry of methane, which is the major known constituent of Titan's atmosphere was examined with stress on what can be learned from photochemistry and particle irradiation. The composition of dust that comprises the haze layer was determined. Isotope fractionation in planetary atmospheres is also discussed. T.M.

N82-26149*# Hawaii Univ., Honolulu.
SPECTROSCOPY OF TRITON AND PLUTO: CURRENT STATUS AND PROSPECTS
Dale P. Cruikshank *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 2 Apr. 1982 p 699-706 refs (For primary document see N82-26134 16-91)
Avail: NTIS HC A11/MF A01 CSCL 03B

Near-infrared spectrophotometry of Triton and Pluto at low spectral resolution and signal precision reveals methane absorption on both bodies. The absorption on Triton is probably gaseous CH4, while that on Pluto is a combination of gas and ice of CH4. Using present detectors and telescopes, spectra of Triton and Pluto can be obtained which are 5-10 times better than those published, but such data will not be sufficient to distinguish between gaseous and solid methane on these bodies. Author

N82-26150*# Texas Univ., Austin.
COMMENTS ON PLUTO'S ATMOSPHERE
L. Trafton *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 2 Apr. 1982 p 709-715 refs (For primary document see N82-26134 16-91)
Avail: NTIS HC A11/MF A01 CSCL 03B

A pure CH4 atmosphere would rapidly escape from Pluto. For such an atmosphere, even CH4 frosts on Pluto's surface would completely sublimate on a time scale short compared to Pluto's life. Observations of CH4 therefore imply that its atmosphere must also contain another gas in significant quantity. Author

N82-26151*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPECULATIONS ON THE INFRARED MOLECULAR SPECTRA OF COMETS
Michael J. Mumma *In its* Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 2 Apr. 1982 p 717-742 (For primary document see N82-26134 16-91)
Avail: NTIS HC A11/MF A01 CSCL 03B

No infrared vibration-rotation spectra have yet been seen for any comet, even though molecular emission features in the ultraviolet and visual regions are common, and gaseous matter is the dominant constituent of the coma. This is in part due to instrumental and atmospheric limitations, but also because non-LTE conditions prevail nearly everywhere throughout the coma and tails, leading to unusual spectra. Aspects of cometary physics and non-LTE spectroscopy are considered. Some aspects of the infrared signatures of cometary molecules are predicted. T.M.

N82-26152*# National Aeronautics and Space Administration, Washington, D. C.
VOYAGES TO SATURN
David Morrison 1982 232 p refs
(NASA-SP-451; NAS 1.21:451; LC-81-600073) Avail: NTIS HC A11/MF A01 CSCL 03B

The Voyager mission to Saturn is explained in detail. A history of Saturn observations from ancient times to the present is given. The Voyager spacecraft and their instruments are described. An overview of planetary astronomy is presented. The text is supplemented by numerous black and white and color photographs. The Saturn satellites are discussed in detail, and preliminary pictorial maps of the satellites are given. R.J.F.

N82-26153*# Texas Univ., Austin. Dept. of Astronomy.
DOPPLER LINE PROFILES MEASUREMENT OF THE JOVIAN LYMAN ALPHA EMISSION WITH OAO-C Final Technical Report
Edwin S. Barker, William D. Cochran, and Harlan J. Smith 8 Jun. 1982 36 p refs Submitted for publication
(Grant NAG5-114; NGR-44-012-152)
(NASA-CR-169007; NAS 1.26:169007) Avail: NTIS HC A03/MF A01 CSCL 03B

Observation of Jupiter made with the high resolution ultraviolet spectrometer of the Orbiting Astronomical Observatory copernicus in April and May, 1980, yield a Jovian Lyman alpha emission intensity of 7 + or 2.5 RR. This indicates a decrease by about a factor of two since the Voyager ultraviolet spectrometer measurements, nearly a year earlier. An unusually high column abundance of hydrogen atoms above the methane homopause at the Voyager epoch is indicated. Since the auroral charged particle bombardment of molecular hydrogen is expected to contribute significantly to the global population of the hydrogen atoms, it is suggested that at the time of the Voyager Jupiter encounter unusually high auroral activity existed, perhaps d to the high concentration of the Io plasma torus. The temporal variation of the Saturn lyman alpha emission, when contrasted with the Jovian data, reveals that the auroral processes are not nearly as important in determining the Saturn Lyman alpha intensity in the nonauroral region. J.D.

N82-26092# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
HELIOS MISSION: MISSION OBJECTIVES, MISSION VERIFICATION, SELECTED RESULTS
Herbert Porsche *In* ESA The Solar System and its Exploration Nov. 1981 p 43-50 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

N82-26097# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
MEASUREMENT OF PLASMA DRIFTS IN PLANETARY MAGNETOSPHERES
R. Grard, G. Haerendel, and F. Melzner (Max-Planck Inst. fuer Extraterristrische Physik, Garching, West Germany) *In* ESA The Solar System and its Exploration Nov. 1981 p 97-104 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

N82-26099# Institut fuer Allgemeine und Angewandte Geophysik, Munich (West Germany).
PLANETARY AND LUNAR MAGNETISM
J. Pohl *In* ESA The Solar System and its Exploration Nov. 1981 p 115-120 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

N82-26100# Newcastle-upon-Tyne Univ. (England).
HEAT TRANSFER AND THE DEVELOPMENT OF PLANETARY STRUCTURE
D. C. Tozer *In* ESA The Solar System and its Exploration Nov. 1981 p 121-126 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

N82-26101# Ludwig-Maximilians-Universitaet, Munich (West Germany). Inst. fuer Allgemeine und Angewandte Geologie.
SURFACE HISTORY OF THE TERRESTRIAL-TYPE PLANETS
Gerhard Neukum *In* ESA The Solar System and its Exploration Nov. 1981 p 129-137 refs Original contains color illustrations (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

N82-26102# Max-Planck-Institut fuer Chemie, Mainz (West Germany). Otto-Hahn Inst.
CHEMISTRY AND ACCRETION HISTORY OF THE EARTH AND THE INNER PLANETS
H. Waenke *In* ESA The Solar System and its Exploration Nov. 1981 p 141-150 refs (For primary document see N82-26087 16-88)

Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

N82-26103# Centre National de la Recherche Scientifique, Verrieres-le-Buisson (France). Service d'Aeronomie.
SPACE MISSIONS TO VENUS
J. L. Bertaux *In* ESA The Solar System and its Exploration Nov. 1981 p 151-156 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

N82-26104*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PHYSICS OF PLANETARY ATMOSPHERES AND IONOSPHERES
Siegfried J. Bauer *In* ESA The Solar System and its Exploration Nov. 1981 p 157-160 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

N82-26105*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE ATMOSPHERES OF JUPITER, SATURN AND TITAN
Siegfried J. Bauer *In* ESA The Solar System and its Exploration Nov. 1981 p 161-163 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

N82-26106# Innsbruck Univ. (Austria). Inst. fuer Meteorologie und Geophysik.
OPTICAL AND INFRARED MEASUREMENTS ON PLANETARY ATMOSPHERES
H.-J. Bolle *In* ESA The Solar System and its Exploration Nov. 1981 p 165-172 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

N82-26107# Technische Universitaet, Munich (West Germany). Inst. fuer Mineralogie.
THE MOON: ITS STRUCTURE, ORIGIN, AND DEVELOPMENT
Alan B. Binder *In* ESA The Solar System and its Exploration Nov. 1981 p 175-178 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

N82-26108# Technische Hochschule, Vienna (Austria). Inst. of Analytical Chemistry.
JUPITER'S MOONS
W. Kiesl *In* ESA The Solar System and its Exploration Nov. 1981 p 179-185 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

N82-26111# Centre National de la Recherche Scientifique, Verrieres-le-Buisson (France). Service d'Aeronomie.
AERONOMICAL PROCESSES IN COMETARY COMAE
Michel Festou *In* ESA The Solar System and its Exploration Nov. 1981 p 213-219 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N82-26154# Bern Univ. (Switzerland). Div. of Solar Observations.
SOLAR DATA FOR FEBRUARY - MAY 1981
M. Fuhrer, N. Kaempfer, A. Magun, J. Neversil, W. Schoechlin, and H. Wiehl Jun. 1981 45 p
(Rept-45) Avail: NTIS HC A03/MF A01
The results of the standard measurements carried out at the solar observatory are presented. The measurements show start, maximum, duration, peak flux, and circular polarization at peak as percentage, of outstanding events. Author (ESA)

N82-26155# Bern Univ. (Switzerland). Div. of Solar Observations.
SOLAR DATA FOR NOVEMBER 1980 - JANUARY 1981
M. Fuhrer, N. Kaempfer, A. Magun, J. Neversil, W. Schoechlin, and H. Wiehl Jan. 1981 32 p
(Rept-44) Avail: NTIS HC A03/MF A01
The results of the standard measurements carried out at the solar observatory are presented. The measurements show start, maximum, duration, peak flux, and circular polarization at peak as percentage of outstanding events. Author (ESA)

N82-26156# Bern Univ. (Switzerland). Div. of Solar Observations.
SOLAR DATA FOR JUNE - DECEMBER 1981
M. Fuhrer, N. Kaempfer, A. Magun, J. Neversil, W. Schoechlin, and H. Wiehl Feb. 1982 50 p refs
(Rept-47) Avail: NTIS HC A03/MF A01
The results of the standard measurements carried out at the solar observatory are presented. The measurements show start, maximum, duration, peak flux, and circular polarization at peak as percentage, of outstanding events. Author (ESA)

N82-26157# National Oceanic and Atmospheric Administration, Boulder, Colo.
EVOLUTIONARY CHARTS OF SOLAR ACTIVITY (CALCIUM PLAGES) AS FUNCTIONS OF HELIOGRAPHIC LONGITUDE AND TIME 1964-1979
E. Ruth Hedeman, Helen W. Dodson, and Edmond C. Roelof Aug. 1981 116 p
(PB82-130774; UAG-81; NOAA-81100601) Avail: NTIS HC A06/MF A01 CSCL 03B
Evolutionary charts were prepared on the basis of McMath-Hulbert Observatory data and diagrams, (with the exception of the last three months of 1979, for which plage data from the Hale Observatories). These charts organize data relating to practically all calcium plages reported in the years 1964 to 1979. The survey covers centers of activity for all of Cycle 20 and the rise to maximum of Cycle 21. More than 200 solar rotations are represented in the charts. The remarks summarize significant solar characteristics as well as terrestrial effects such as geomagnetic storms and energetic particle events. In addition, a quantitative active region index and a more detailed active region profile is computed from five solar indicators of the regions' disc transit activity. GRA

N82-26090# Universitaets-Sternwarte Goettingen (West Germany).
THE SUN AS A STAR
W. Deinzer *In* ESA The Solar System and its Exploration Nov. 1981 p 25-28 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

N82-26091# Oxford Univ. (England). Dept. of Theoretical Physics.
THE SOLAR ATMOSPHERE: FROM PHOTOSPHERE TO CORONA
C. Jordan *In* ESA The Solar System and its Exploration Nov. 1981 p 29-39 refs (For primary document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

N82-26093# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
THE INTERNATIONAL SOLAR POLAR MISSION (ISPM)
R. G. Marsden and K.-P. Wenzel *In* ESA The Solar System and its Exploration Nov. 1981 p 51-59 refs (For primary

document see N82-26087 16-88)
Avail: NTIS HC A12/MF A01; ESA, Paris FF 125 Member States, AU, CN and NO (+20% others)

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N82-26158*# California Univ., Berkeley. Space Sciences Lab.
DEFINITION STUDY FOR AN ADVANCED COSMIC RAY EXPERIMENT UTILIZING THE LONG DURATION EXPOSURE FACILITY Final Report, 17 Jul. 1980 - 30 Sep. 1981
P. B. Price 1 Jun. 1982 56 p refs
(Contract NAS1-16268)
(NASA-CR-165918; NAS 1.26:165918) Avail: NTIS HC A04/MF A01 CSCL 03B

To achieve the goals of cosmic ray astrophysics, an ultraheavy cosmic ray experiment on an LDEF reflight should be in an orbit with high inclination (approximately 57 deg) at approximately 230 nm for approximately 2 years near solar minimum (approximately 1986). It should fill 61 trays. Each tray should contain 4 modules of total active area 0.7 sq m, with a thermal blanket, thermal labyrinth mounts, aluminum honeycomb mechanical support, and total weight approximately 100 kg. Each module should contain interleaved CR39, Lexan, and thin copper sheets plus one event-thermometer canned in a thin metal cannister sealed with approximately 0.2 atm dry O2. The CR39 and Lexan should be manufactured to specifications and the sheet copper rolled to specifications. The event-thermometer should be a stiffened CR39 sheet that slides via bimetal strips relative to fixed CR39 sheet so that stack temperature can be read out for each event. The metal cannister can be collapsed at launch and landing, capturing the sliding assembly to prevent damage. An engineering study should be made of a prototype LDEF tray; this will include thermal and mechanical tests of detectors and the event thermometer. Author

N82-26159# Lund Univ. (Sweden). Dept. of Cosmic and Subatomic Physics.
GALACTIC COSMIC RAY IRON COMPOSITION
R. Scherzer, W. Enge, R. Beaujean, S. Hertzman, K. Kristansson, and K. Soederstroem Nov. 1980 17 p refs Prepared in cooperation with Kiel Univ., West Germany
(LUIP-8003) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The isotopic composition of galactic cosmic ray iron was studied in the energy interval 500-750 MeV/nucleon with a visual track detector system consisting of nuclear emulsion and cellulose nitrate plastic. Stopping iron nuclei were identified from ionization range measurements in the two detector parts. Cone lengths were measured in the plastic sheets and the residual ranges of the particles were measured in plastic and in emulsion. The mass of iron-17 nuclei was determined with an uncertainty of about 0.3 amu. The isotopic composition at the detector level was found to be Fe-52:Fe-53:Fe-54:Fe-55:Fe-56:Fe-57:Fe-58 = 0:1:4:3:8:1:0. These numbers are not in conflict with the assumption that the isotopic composition of cosmic ray iron at the source is similar to the solar system composition. DOE

N82-26160# Los Alamos Scientific Lab., N. Mex.
COSMIC-RAY-INDUCED RADIATION ENVIRONMENT AND DOSE TO MAN FOR LOW-ORBIT SPACE APPLICATIONS
H. A. Sandmeier, G. E. Hansen, M. E. Battat, and K. OBrien Sep. 1981 30 p
(Contract W-7405-eng-36)
(DE82-001882; LA-8975-MS) Avail: NTIS HC A03/MF A01

Neutrons and photons resulting from the interaction of galactic cosmic rays with the material of an orbiting satellite or an orbiting space station at an altitude of some few hundreds of kilometers, and below the level of the radiation belts, were calculated as a function of geomagnetic latitude and solar activity level. The photon and neutron leakage currents from the top of the atmosphere were computed. The radiation dose-equivalent rate to an unshielded astronaut was also calculated. The maximum dose-equivalent rate, near the magnetic poles, was 2 mrem/h. In deep space this would amount to 18 rem/y, indicating that for a prolonged stay in space, shielding would be needed. DOE

N82-26056*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
CORONAE OF NONDEGENERATE SINGLE AND BINARY STARS: A SURVEY OF OUR PRESENT UNDERSTANDING AND PROBLEMS RIPE FOR SOLUTION
Jeffrey L. Linsky *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 13-36 refs (For primary document see N82-26055 16-88)
(Grants NGL-06-003-057; NAG-8316; NAG-8334; NAG-8382; NAG-8400)
Avail: NTIS HC A99/MF A01 CSCL 03B

N82-26057*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
CONTINUUM AND LINE SPECTRA OF DEGENERATE DWARF X-RAY SOURCES
Don Q. Lamb *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 37-67 refs (For primary document see N82-26055 16-88)
(Grant NAGw-246)
Avail: NTIS HC A99/MF A01 CSCL 03B

N82-26058*# Illinois Univ. - Urbana, Champaign. Dept. of Physics.
NEUTRON STAR BINARIES, PULSARS AND BURST SOURCES
Fred K. Lamb *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 77-106 refs (For primary document see N82-26055 16-88)
(Grants NsG-7653; NSF PHY-80-25605)
Avail: NTIS HC A99/MF A01 CSCL 03B

N82-26062*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
X-RAYS FROM QUASARS AND ACTIVE GALAXIES
Alan P. Lightman *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 143-182 refs (For primary document see N82-26055 16-88)
(Grant NAGw-246)
Avail: NTIS HC A99/MF A01 CSCL 03B

N82-26063*# Mullard Space Science Lab., Dorking (England).
A EUROPEAN X-RAY ASTROPHYSICS MISSION
J. Len Culhane *In* NASA. Goddard Space Flight Center X-ray Astronomy in the 1980's Nov. 1981 p 183-217 refs Prepared in cooperation with University College, London (For primary document see N82-26055 16-88)
Avail: NTIS HC A99/MF A01 CSCL 09B

99 GENERAL

N82-26161# Indian Inst. of Science, Bangalore.
THE JOURNAL OF THE AERONAUTICAL SOCIETY OF INDIA VOLUME 32, NUMBERS 1-4, FEBRUARY - NOVEMBER 1980
A. K. Rao, ed. Mar. 1982 164 p refs
Avail: NTIS HC A08/MF A01

A collection of articles concerning recent research on aeronautics and space topics is presented. Subjects discussed in this issue are: rotating ailerons, satellite attitude control, composite materials, wind tunnel stability measurements, columns and supports, satellite lifetime prediction, transient heat conduction, and variable thrust programming for rockets. For individual titles, see N82-26162 through N82-26184.

N82-26162# Indian Inst. of Tech., Bombay. Dept. of Aeronautical Engineering.

INVESTIGATION ON ROTATING AILERONS c02

S. Mozumdar and T. S. Patel *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 1-5 refs (For primary document see N82-26161 16-99)

Avail: NTIS HC A08/MF A01

The effectiveness of rotating ailerons in a subsonic flow was theoretically studied with a view to evaluate their capability in comparison to the conventional ones. The present analysis is based on the vortex lattice approach of Byelotserkovskii for different wing planforms of small and large aspect ratios. The effect of such ailerons on the coefficients of lift and rolling moment was worked out for their positions corresponding to the most suitable positions of rotating flaps. Author

N82-26163# Indian Space Research Organization, Trivandrum. Aerodynamics Div.

COUPLED LIBRATIONAL CONTROL OF SATELLITE USING SIMPLIFIED SOLAR CONTROLLER WITH SPRING-MASS DAMPER c15

Rajeev Lochan and K. Kumar (Indian Inst. of Technology, Kanpur) *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1982 p 7-16 refs (For primary document see N82-26161 16-99)

Avail: NTIS HC A08/MF A01

It was found that the simple spring-mass damping mechanism is not adequate for the damping of roll and yaw librational modes, the continued excitation of which, in turn, adversely affects even the pitching damping. On the other hand, the various solar pressure attitude controllers, although quite effective, are too cumbersome as they involve several sets of panels and their controlled motion in several degrees of freedom. Here, the possibility of utilizing the mass-spring energy dissipating mechanism for simplifying the solar pressure attitude controller was investigated. The analysis shows that the proposed combination of a simple one set of the radiation control surfaces and the mass spring attachment is quite effective in damping all the three librational degrees of freedom. Author

N82-26164# Indian Inst. of Tech., Bombay. Dept. of Aeronautical Engineering.

PENNY SHAPED CRACK AT THE INTERFACE OF TWO BONDED LAYERS OF DISSIMILAR ELASTIC MATERIALS c39

A. C. Garg *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 17-25 refs (For primary document see N82-26161 16-99)

Avail: NTIS HC A08/MF A01

The axially symmetric elastostatic problem for two bonded layers of different mechanical properties is considered. It is assumed that there is a penny-shaped crack on the interface the surfaces of which are subjected to a known internal pressure. To solve the problem, the displacement field in the composite layer is represented in the form of Hankel transforms which lead to a set of simultaneous dual integral equations. By using Abel operators these equations are transformed to similar equations involving Fourier sine and cosine transforms. Suitable integral representations for the unknown functions then lead to a singular integral equation of Cauchy-type. The equation is solved for thick layers using expansion method. Some numerical results are presented for strain energy and critical pressures. Author

N82-26165# Aeronautical Development Establishment, Bangalore (India).

ANALYSIS OF INTERFACE STRESSES IN PHOTOELASTIC COMPOSITES c24

K. Abraham Jacob *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 27-36 refs (For primary document see N82-26161 16-99)

Avail: NTIS HC A08/MF A01

The problem of analysing interface stresses in composites using Photoelastic models is briefly discussed. A new method is suggested for separating the interface continuity conditions. The solutions are given for two and three dimensional composite bodies with rigid-elastic and elastic-elastic interfaces. The problems associated with out-of-plane restraint and partial restraint of displacements in two dimensional composite interfaces are discussed and certain solutions are provided. Author

N82-26166# National Aeronautical Lab., Bangalore (India).

A SELF EXCITATION AND CONTROL SYSTEM FOR WIND TUNNEL DYNAMIC STABILITY MEASUREMENTS c09

R. V. Jategaonkar, R. Viswanathan, and N. A. Vasudeva Rao (Indian Telephone Industries) *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 37-44 refs (For primary document see N82-26161 16-99)

Avail: NTIS HC A08/MF A01

The design and development of a fast acting self-excitation and control system based on the principles of regenerative and negative feedback for phase resonance testing of aerodynamic models in wind tunnels is described. Simulation tests and analysis using a linearized model of the drive system were carried out to establish the satisfactory performance of the controller. A brief discussion about the successful wind tunnel tests carried out using this excitation control system for system for dynamic stability measurements is also presented. Author

N82-26167# Indian Inst. of Tech., Kanpur. Dept. of Aeronautical Engineering.

STRONGEST UNIFORM NONHOMOGENEOUS COLUMNS c39

V. K. Gupta and P. N. Murthy *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 45-49 refs (For primary document see N82-26161 16-99)

Avail: NTIS HC A08/MF A01

The problem of optimal design of columns received considerable attention in the recent past. It was established that considerable increases in critical loads of homogeneous columns, can be achieved by an optimal stiffness distribution. As stiffness variation in a general case can be achieved by varying cross-sectional area and/or modulus, an attempt is made here to examine further gains in the critical load if the material is non-homogeneous. Study is confined to strongest-uniform columns with longitudinal variation of modulus. L.F.M.

N82-26168# Indian Space Research Organization, Trivandrum.

EFFECT OF RAREFIED DRAG ON LIFE TIME ESTIMATION OF SATELLITES c15

K. K. Biswas *In* Indian Inst. of Science The J. of Aeron. Soc. of India, Vol. 32 No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 51-54 refs (For primary document see N82-26161 16-99)

Avail: NTIS HC A08/MF A01

The effects of drag coefficient on the estimation of life time of satellites are discussed. Usual practice in life time estimation of satellites e.g., King-Hell method assume constant drag coefficient and an average drag area. Here the drag coefficient and drag areas were estimated by using free molecular flow theory taking into account of actual shape of the satellite. It was possible to eliminate the uncertainity of the assumption of drag coefficient, 2.0 or 2.2. It was found that the present method gives better estimation of life of satellites specially for unsymmetrical shaped satellites. Author

N82-26169# Indian Space Research Organization, Trivandrum. Structural Engineering Div.

A FRONTAL SOLUTION FOR EQUILIBRIUM METHOD OF ANALYSIS c39

S. Yadagiri and K. Prabhakaran *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 55-63 refs (For primary document see N82-26161 16-99)

Avail: NTIS HC A08/MF A01

Frontal solution technique as applied to the equilibrium method of analysis of structures is presented. Equilibrium matrix is highly sparse and unsymmetric. Frontal solution technique makes use of the sparsity effectively. It reduces the required incore memory and consequently the computational time. Assemblying and elimination are performed simultaneously. Basic equations of equilibrium method and a scheme for minimization of frontal width are presented. Efficiency of the present procedure is compared with the method considering full matrix. Author

N82-26170# Indian Space Research Organization, Trivandrum. Mission Analysis Group, Project SLV.

ANALYTICAL STUDY OF SPINNING SOLID UPPER STAGE DYNAMICS c15

K. A. P. Menon and N. Sundararajan *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 65-76 refs (For primary document see N82-26161 16-99)

Avail: NTIS HC A08/MF A01

Analytical solutions for the spinning vehicle dynamics during the burning phase in vacuum were derived. These solutions explicity incorporate the effects of thrust misalignment, gravity gradient torques, jet damping, dynamic unbalance and spin rate variations. These expressions are useful in preliminary design studies of spinning upper stages of launch vehicles. The main advantages of this approach lies in the fact that the time required to carry out detailed parametric studies is one order lower than regular 6 DOF simulations. The application of this approach for a typical Shuttle Launched Spinning Solid Upper Stage (SSUS) mission incorporating AS-05-A payload is illustrated. Author

N82-26171# National Aeronautical Lab., Bangalore (India). Structures Div.

TRANSIENT HEAT CONDUCTION ANALYSIS OF LAMINATED COMPOSITE NOSE CONE c24

J. M. Mahishi, Ramesh Chandra, and M. V. V. Murthy *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 77-84 refs (For primary document see N82-26161 16-99)

Avail: NTIS HC A08/MF A01

Transient heat conduction analysis of composite nose cone subjected to aerodynamic heating by finite element technique in space domain and finite difference technique in time domain is presented. An anisotropic rectangular ring element with four nodal circles, each having temperature as degree of freedom is developed. Application of finite element technique in space domain resulted in a set of first order coupled differential equations in time domain. These were solved by Crank-Nicholson finite difference scheme. Four test examples were used to validate the development of element and associated computer program. The software developed was applied to the problem of glass-epoxy nose cone subjected to a typical aerodynamic heat input. Author

N82-26172# National Defence Academy, Pune (India). Dept. of Mathematics.

VARIABLE THRUST PROGRAMMING FOR ROCKETS FLOWN WITH CONSTANT THRUST INCLINATION WITH RESPECT TO HORIZON IN VACUUM c20

S. N. Maitra *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 85-93 refs (For primary document see N82-26161 16-99)

Avail: NTIS HC A08/MF A01

The rocket performance for variable thrust program is considered. Vertically ascending path as well as trajectories flown with constant thrust inclination with respect to horizon owing to such a thrust program were analyzed. The peak altitudes (for vertically ascending paths) and ranges (for constant thrust inclination to horizon) associated with all the variable thrust programs are greater than those associated with constant thrust program with the same propellant mass ratio and initial thrust-to-weight ratio. Some numerical examples are also cited. Author

N82-26173*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

THE COUPLED EFFECTS OF CHEMISTRY AND DIFFUSION ON THE STRATOSPHERIC ZONE REDUCTION c46

R. N. Gupta (Indian Inst. of Technology, Kanpur) and W. L. Grose *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 322, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 95-99 refs Presented at the Space Sci. Symp., VSSC, Trivandrum, India, 18-21 Jan. 1977 (For primary document see N82-26161 16-99)

Avail: NTIS HC A08/MF A01 CSCL 13B

The effect of diffusive-mixing on O3 depletion using the 5 step chemistry model is estimated. N.W.

N82-26174# Indian Space Research Organization, Trivandrum. Chemicals and Materials Group.

A DIRECT RANDOM SEARCH TECHNIQUE FOR THE OPTIMIZATION OF PROPELLANT SYSTEMS c28

V. Swaminathan and N. S. Madhavan *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 101-104 refs (For primary document see N82-26161 16-99)

Avail: NTIS HC A08/MF A01

A numerical technique for determining, for a given metallized solid propellant system, the optimum composition of propellant ingredients (such as binder, oxidizer and metallic additive) by thermodynamic means so as to arrive at a composition which corresponds to the highest specific impulse is discussed. The specific impulse of the propellant is expressed as a function of the reactants and optimizing the same, subject to the usual linear and nonlinear constraints. The optimization is carried out by a direct random search technique and systematic reduction of the search region with the frozen flow specific impulse as the objective function. The usual simplifying assumptions such as one dimensional flow of gases, their ideal behaviour, adiabatic and isentropic expansion through the nozzle and the existence of chemical equilibrium were made in the computations. The composition of the products for any specific propellant combination is obtained by the free energy minimization technique. A computer program written for this purpose yielded satisfactory results for certain typical propellant systems. Author

N82-26175# Indian Inst. of Tech., Madras. Dept. of Aeronautical Engineering.

DOWNWASH BEHIND A WING WITH SPANWISE BLOWING c02

P. Ramesh Kumar and E. G. Tulapurkara *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 p 105-108 refs (For primary document see N82-26161 16-99)

Avail: NTIS HC A08/MF A01

The effect of blowing on the longitudinal stability of an airplane is considered in light of the changes in downwash behind the wing. A theoeretical estimate of downwash is described. Author

N82-26176# National Aeronautical Lab., Bangalore (India).

FINITE ELEMENT ANALYSIS OF SOME AEROSPACE SHELL STRUCTURES c39

S. Viswanath, S. Sridhara Murthy, and C. G. Shah *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 109-115 refs (For primary document see N82-26161 16-99)

Avail: NTIS HC A08/MF A01

A computer program LINSHL, for the linear static analysis of stiffened shell structures was developed incorporating (1) a high precision triangular cylindrical shell element, (2) a high precision triangular shallow shell element, (3) a curved beam element and (4) a straight beam element. The numerical results obtained, using LISNSHL, from the stress analysis of practical structures as (1) a ring-stiffened cylinder and (2) a canopy hood of a typical aircraft are presented. The predictions of the analysis are compared with available results. Author

N82-26177# Government Engineering Coll., Jabalpur (India). Dept. of Mechanical Engineering.

A STUDY OF STREAMWISE VELOCITY PROFILES IN THREE DIMENSIONAL TURBULENT BOUNDARY LAYERS c34

Neeraj Dubey *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 117-119 refs (For primary document see N82-26161 16-99)

Avail: NTIS HC A08/MF A01

The values of two free parameters were obtained from streamwise velocity profiles for three dimensional turbulent boundary layer flows. N.W.

N82-26178# Indian Inst. of Tech., Madras. Dept. of Aeronautical Engineering.

NONSTEADY AXISYMMETRIC STAGNATION POINT FLOW WITH HARD BLOWING c34

A. Jagadesh Prasad and N. R. Rajappa *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov.

1980 Nov. 1980 p 121-124 refs (For primary document see N82-26161 16-99)
Avail: NTIS HC A08/MF A01

The heat transfer to the wall in aerodynamic heating which can be reduced by hard blowing was studied. Hard blowing at the stagnation point blows off the boundary layer. The flow field is made up of three regions. Region consists of injected flow which is essentially nonviscous, is inviscid but rotational and there is a first approximation which is valid only near the wall, for hard blowing with a velocity one order higher than the usual vertical component of velocity in the boundary layer. Regions 2 and 3 refer to a shear layer and outer region respectively. Regions 1 and 2 are approximately of order (Re) to the minus 1/2 power which validates boundary layer approximations in these regions. In the singular perturbation solution, the viscous term containing the highest derivatives is eliminated from the equation and satisfies only the boundary condition at the wall. E.A.K.

N82-26179# P. D. Women's Coll., Jalpaiguri (India). Dept. of Mathematics.
SOME CASES OF BUCKLING OF SANDWICH PLATES **c39**
P. Biswas *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 125-127 refs Sponsored in part by the University Grants Commission (For primary document see N82-26161 16-99)
Avail: NTIS HC A08/MF A01

Basic governing equations for the deflection of a sandwich plate were derived and critical buckling compression for simply supported triangular plates and clamped circulate plate were determined. Trilinear coordinates were used for equilateral triangular plate and for a circulate plate. Results are obtained by Bessel functions. It is found that for sandwich plated the critical buckling loads are much higher than for homogeneous plates. E.A.K.

N82-26180# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.
ATTITUDE ACQUISITION USING MOMENTUM TRANSFER AND REACTIONS JETS **c15**
Shashi Kant Shrivastava and Shrihari Roy *In its* The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 129-131 refs (For primary document see N82-26161 16-99)
Avail: NTIS HC A08/MF A01

An attitude acquisition maneuver using momentum transfer which minimizes the propellant and sensor requirements was proposed. Both the transition between the two stabilization modes and the reorientation of the spacecraft can be achieved simultaneously by slowly accelerating a pitch axis mounted reaction wheel to the nominal speed with proper initial condition of the spacecraft. Through physical arguments supported by digital simulation, it is shown that the final nutation angle can be decreased by reducing the wheel torque, increasing the difference in the maximum and intermediate moment of inertia and by slightly increasing the initial spin of the satellite. Geometric interpretation of the associated momentum and energy conservation is examined. E.A.K.

N82-26181# Indian Inst. of Tech., Bombay. Dept. of Aeronautical Engineering.
DESIGN, FABRICATION AND TESTING OF AN ELECTRICAL ANALOGUE FOR HEAT TRANSFER TO COATED TURBINE BLADE **c07**
P. R. Joshi and W. V. Nabar *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 12, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 133-136 (For primary document see N82-26161 16-99)
Avail: NTIS HC A08/MF A01

Heat transfer to a coated solid turbine blade was studied. The analog method was used to study heat transfer to a coated blade for other types of cooled blades. The analogue method is most suitable when a large varieties of blade profiles with different coatings and thickness are to be tested to arrive at an optimum solution. The analogue method is based on the fact that the governing equations for heat conduction in isotropic, homogeneous nonheat generating body under steady state conditions are the same as those governing the steady state distribution of electrical potential. The analogy can be extended further to explain the concept of thermal resistance. E.A.K.

N82-26182# National Aeronautical Lab., Bangalore (India). Aerodynamics Div.
JET SIMULATION STUDIES IN THE 1.2M WIND TUNNEL **c02**
O. A. Lokhandwala, N. B. Mathur, and Jai Mohan *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 137-142 refs (For primary document see N82-26161 16-99)
Avail: NTIS HC A08/MF A01

The stage separation of a typical vehicle was studied in the 1.2m trisonic wind tunnel. The study consists of two parts: (1) jet simulation technique, in particular a method adopted to simulate hot jet using cold jet; (2) facility, set up details, surface pressure measurements obtained on the upper stage (sustainer) and some of the observed Schlieren flow pattern for different separation distances at zero degree incidence are described. It is concluded that: no significant effects are found on jettisoned stage on parent stage beyond $X/D = 0.8$, for $X/D < 0.4$ nozzle flow is subsonic and flow is oscillating in nature; pressure distribution data are supported. E.A.K.

N82-26183# Hindustan Aeronautics Ltd., Bangalore (India). Central Lab., Foundry and Forge Div.
FATIGUE OF GLASS FIBRE REINFORCED LAMINATES **c24**
P. K. Kurien and Krishnadas Nair *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 143-147 refs (For primary document see N82-26161 16-99)
Avail: NTIS HC A08/MF A01

The fatigue properties of three types of glass fiber reinforced plastics (GRP) laminates, using two types of resins and woven and mat type fabrics were assessed. The mechanism of fatigue damage and crack propagation were studied metallographically. It is concluded that improvement in the fatigue properties of the laminates is obtained by modifying the matrix, by decreasing brittleness. E.A.K.

N82-26184# CIERS Research and Consultancy Private Ltd., Bangalore (India).
PRIMARY SEWAGE TREATMENT PLANT AS A SOURCE OF BIRD HAZARDS AT AIRPORT **c03**
S. C. Pillai, M. K. C. Sridhar, and G. Kasi Viswanath *In* Indian Inst. of Science The J. of the Aeron. Soc. of India, Vol. 32, No. 1-4, Feb.-Nov. 1980 Nov. 1980 p 149-153 refs (For primary document see N82-26161 16-99)
Avail: NTIS HC A08/MF A01

Quantitative observations were made on the visits of different kinds of birds, notably eagles or kites and crows, and on their movements around the different parts of the primary sewage treatment plant located in the neighborhood of the airport at Bangalore. The following information is reported: (1) early records on collisions between birds and aircrafts; (2) bird strike as a world wide problem; (3) the reasons for the attraction of birds to airports; (4) early attempts to solve the problem of bird hazards; and (5) the conditions in India. Suggestions are made to prevent bird visits to the airport area. E.A.K.

N82-26185# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
LA RECHERCHE AEROSPATIALE, BI-MONTHLY BULLETIN, NUMBER 1981-6, NOVEMBER-DECEMBER 1981
Claude Sevestre, ed. Paris ESA Mar. 1982 72 p refs Transl. by ONERA into ENGLISH from 'La Rech. Aerospatiale, Bull. Bimestriel (Paris) No. 1981-6, Nov.-Dec. 1981' Sponsored by ESA
(ESA-TT-741) Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 55

The interaction of an oblique jet with a subsonic flow was studied. Aerodynamic flow measurement, using fluorescence and laser Doppler velocimetry are discussed. Fatigue crack propagation, and subsonic flutter of compressor blades were examined. Approximate compressibility relations and Euler equations of motion are treated. An implicit pseudo unsteady calculation

method for transonic flow is presented. For individual titles, see N82-26186 through N82-26192.

N82-26186# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

EXPERIMENTAL STUDY BY LASER VELOCIMETRY OF THE INTERACTION OF AN OBLIQUE JET WITH A SUBSONIC FLOW **c02**

M. Izard and J. Labbe *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1981-6, Nov.-Dec. 1981 (ESA-TT-741) Mar. 1982 p 1-15 refs Transl. by ONERA into ENGLISH from 'La Rech. Aerospatiale, Bull. Bimestriel (Paris) No. 1981-6, Nov.-Dec. 1981' (For primary document see N82-26185 16-99)

Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 55

The penetration of a jet into a subsonic flow, like in the cooling of turbine blades by injecting was studied by laser. A protective gas film is described. A forward scattering optical setup is used for measurement in vertical planes and parallel to the symmetry plane of the setup. Horizontal plane measurements exploit backscattering. The setup demonstrates as the high level velocity fluctuations in the jet flow interaction zone. Mapping of velocities, turbulences and Reynolds stress shows the progressive formation of two contrarotating vortices in the mixing zone.

Author (ESA)

N82-26187# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

DENSITY MEASUREMENTS IN AERODYNAMIC FLOWS USING FLUORESCENCE **c34**

R. Bailly, M. Pealat, and J. P. Taran *In its* La Rech. Aerospatiale, Bi-Monthly Bull. No. 1981-6, Nov.-Dec. 1981 (ESA-TT-741) Mar. 1982 p 17-25 refs Transl. by ONERA into ENGLISH from 'La Rech. Aerospatiale, Bull. Bimestriel (Paris) No. 1981-6, Nov.-Dec. 1981' (For primary document see N82-26185 16-99)

Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 55

Jet mixing dynamic analysis via the fluorescence of polycyclic aromatics is described. The turbulence in the mixing zone of a 1 kg/sec, 900 K free jet powered by a kerosene combustor was investigated. Fluorescence was induced by an argon ion laser. Power spectra of the fluctuations were obtained, and the space-time correlation with other fluctuating variables (infrared and acoustic emissions) was examined. This shows that the method is useful for studying spatially resolved density fluctuations. If polynuclear aromatics are injected in the plenum and downstream from the combustor, operating temperatures > 1000 K are feasible. Mass flow rates on the order of 1 g/sec, or less, are required. The carcinogenic properties of most of these substances necessitates forced ventilation of the test facility.

Author (ESA)

N82-26188# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

FATIGUE CRACK PROPAGATION IN ELASTOPLASTICITY **c39**

L. Anquez *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1981-6, Nov.-Dec. 1981 (ESA-TT-741) Mar. 1982 p 27-45 refs Transl. by ONERA into ENGLISH from 'La Rech. Aerospatiale, Bull. Bimestriel (Paris) No. 1981-6, Nov.-Dec. 1981' (For primary document see N82-26185 16-99)

Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 55

The relation between crack propagation and crack tip plasticity was investigated. The number of parameters needed to describe the local state at the crack tip are determined by studying quasi-static cases where the crack growth rate is well known. Loads with varying amplitudes are applied to see if the parameter or parameters obtained during the study of constant amplitudes is always sufficient to describe the state at the crack tip. The correlation between the identified parameters and propagation rate can be used to predict growth. Constant amplitude load test results show very good correlation between values of the plastic singularity character parameter and experimentally measured growth. Values agree well for two-level variable amplitude loading and overloading. Author (ESA)

N82-26189# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

AEROELASTICY OF COMPRESSOR BLADES: SUBSONIC STALL FLUTTER **c07**

H. Loiseau and E. Szechenyi *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1981-6, Nov.-Dec. 1981 (ESA-TT-741) Mar. 1982 p 47-59 refs Transl. by ONERA into ENGLISH from 'La Rech. Aerospatiale, Bull. Bimestriel (Paris) No. 1981-6, Nov.-Dec. 1981' (For primary document see N82-26185 16-99)

Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 55

The aeroelasticity of turbomachine blades, of cascade wind tunnel and performance tests, were analyzed. Wind tunnel tests involved excitation by hydraulic actuators and pressure transducer measurements. It is found that unsteady pressures causing stall flutter are located on the upper surface, principally in the operating domains where flow is completely separated, while instability is principally a function of the angle of attack. The phase lag of unsteady pressures increases with vibration frequency. When it is sufficiently large, the flutter disappears, even under suitable separation conditions. Unsteady lift and moment, induced by a vibratory pitching movement around any axis are obtained by linear superposition of forces due to heaving and a pitching movement around a given reference axis. The wind tunnel simulated closely compressor flows with good periodicities in five interblade channels. Author (ESA)

N82-26190# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

APPROXIMATE COMPRESSIBILITY LAWS AND SOLUTIONS OF EULER'S EQUATIONS **c02**

H. Viviand *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1981-6, Nov.-Dec. 1981 (ESA-TT-741) Mar. 1982 p 61-62 refs Transl. by ONERA into ENGLISH from 'La Rech. Aerospatiale, Bull. Bimestriel (Paris) No. 1981-6, Nov.-Dec. 1981' (For primary document see N82-26185 16-99)

Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 55

A method to obtain an explicit relation which expresses pressure as a function of density and internal energy in Euler equations is outlined. The steady solution of such equations for plane transonic flow without shock, using hodography, verifies the given compressibility law. The compressibility law results from the isoenergetic and isentropic character of the flow. The hodographic solution is considered as a solution for the complete Euler equations associated with pressure, and for the isentropic Euler equations, the system consisting of the continuity and momentum equations and the pressure-density ratio in isentropic flow. A pseudo-steady approach replaces the unsteady energy equation by Bernoulli's relation, which then expresses pressure as a function of the density and velocity vectors.

Author (ESA)

N82-26191# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

CONTRIBUTION TO THE CALCULATION OF TRANSONIC FLOWS USING AN IMPLICIT PSEUDO-UNSTEADY METHOD **c02**

M. Abdelrahman *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1981-6, Nov.-Dec. 1981 (ESA-TT-741) Mar. 1982 p 63-66 refs Transl. by ONERA into ENGLISH from 'La Rech. Aerospatiale, Bull. Bimestriel (Paris) No. 1981-6, Nov.-Dec. 1981' (For primary document see N82-26185 16-99)

Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 55

A method for solving the Euler equations of one dimensional transonic flows with intense shock waves, was developed. The method reduces calculation time arising from the small time step discretizations required by the need to conserve stability. The continuity equation is discretized by centered finite differences with respect to space. The momentum equation is handled by a mixed differences scheme. A pseudoviscosity term is introduced. Results for the evolution of the Mach number in a convergent-divergent nozzle as a function of the ratio of static pressure at outlet to intake total pressure, and the evolution of the total pressure along the nozzle for three values of this ratio, are presented. The numerical solution agrees closely with the analytic

one away from the shock and represents the position of this shock in a zone of three to four mesh points. Author (ESA)

N82-26192# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
LASER VELOCIMETRY AT S3 MODANE WIND TUNNEL
c09
A. Boutier *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1981-6, Nov.-Dec. 1981 (ESA-TT-741) Mar. 1982 p 67-71 refs Transl. by ONERA into ENGLISH from 'La Rech. Aerospatiale, Bull. Bimestriel (Paris) No. 1981-6, Nov.-Dec. 1981' (For primary document see N82-26185 16-99)
Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 55

The feasibility of laser velocimetry in large, blowdown transonic wind tunnels was investigated. A two-dimensional velocimeter and two XYZ mobile mountings which support the forward scattered light reception part were used. Seeding with incense smoke is necessary in order to accelerate the data acquisition rate. Also, natural particles do not follow the flow exactly, because of their excessive size. In an empty test section, maximum deviations between measured velocities and those deduced from pressure and temperature measurement are a few percent for Mach numbers of 0.6 and 0.7. Author (ESA)

N82-26193# Air Force Human Resources Lab., Brooks AFB, Tex. Plans and Programs Office.
FISCAL YEAR 1983: AIR FORCE TECHNICAL OBJECTIVE DOCUMENT
Feb. 1982 20 p
(AD-A110934; AFHRL-TR-81-43) Avail: NTIS HC A02/MF A01 CSCL 05/9

This document provides the academic and industrial research and development community with a summary of the technical area objectives of Air Force research in the field of training and personnel systems technology. The areas covered are: (1) Manpower and Force Management; (2) Weapon Systems Logistics, Maintenance, and Technical Training; and (3) Air Combat Tactics and Training. Author (GRA)

N82-26194# Joint Chiefs of Staff, Washington, D. C.
SOVIET NEWS AND PROPAGANDA ANALYSIS BASED ON RED STAR, THE OFFICIAL NEWSPAPER OF THE SOVIET DEFENSE ESTABLISHMENT, VOL. 1, NO. 11 Report, 1 - 30 Nov. 1981
1981 51 p
(AD-A111654) Avail: NTIS HC A04/MF A01 CSCL 07/4

The data in this report reflects Soviet print media emphasis and propaganda trends for over two years -- July 1979 to November 1981. During this period, more than 31,000 feature stories and news items were analyzed. The main purpose of this paper is to provide the reader with an overview of Soviet rhetoric and propaganda themes directed to Russian military forces during November 1981. This report contains a summary of the propaganda themes from the Russian language newspaper Red Star. With a circulation of several hundred thousand copies, this 'daily' newspaper is the official publication of the Soviet defense establishment. The feature stories and news items that appear in Red Star are intended to provide daily guidance to the Soviet military political cadre concerning domestic and international issues/events. Men and women in the Soviet armed forces receive political instruction and Marxist interpretation of current events (foreign and domestic) on a daily basis. Red Star is used as the guide for political instruction; it contains the approved 'picture' of issues and events, and outlines the nature of the 'hostile' world to the Soviet military. Therefore, this report provides insights concerning the structured view of the events and the 'world picture' as perceived by the Soviet soldier. GRA

N82-26195# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES 36-1 Monthly Publication, January
F. A. Richards, ed. and Don. J. Peters, ed. 31 Jan. 1982 30 p
(AD-A111434; ESN-36-1) Avail: NTIS HC A03/MF A01 CSCL 05/2

This is a monthly publication presenting brief articles concerning recent developments in European Scientific Research. It is hoped that these articles (which do not constitute part of the Scientific Literature) may prove of value to American scientists by calling attention to current developments and to institutions and individuals engaged in these scientific efforts. The articles are written primarily by members of the staff of ONRL and occasionally articles are prepared by, or in cooperation with members of the scientific staffs of the United States Air Force's European Office of Aerospace Research and Development and the United States Army Research and Standardization Group. Articles are also contributed by visiting Stateside scientists. Author (GRA)

N82-26196# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Aero Propulsion Lab.
AIR FORCE TECHNICAL OBJECTIVE DOCUMENT, FISCAL YEAR 1983
Dec. 1981 59 p Supersedes AFWAL-TR-80-2091
(AF Proj. 9991)
(AD-A110625; AFWAL-TR-81-2129; AFWAL-TR-80-2091)
Avail: NTIS HC A04/MF A01 CSCL 21/5

This Technical Objective Document (TOD) has been prepared by the Aero Propulsion Laboratory to provide science and industry with specific technical objectives which the Air Force feels are critical to maintain aerospace superiority in the future. The TOD contains eight technology planning objectives which cover the technical disciplines of airbreathing propulsion, aerospace vehicle power, fire protection, and aircraft and missile fuels and lubrication. Author (GRA)

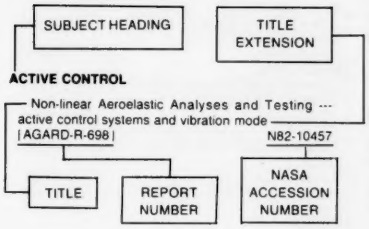
N82-26197# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Flight Dynamics Lab.
AIR FORCE TECHNICAL OBJECTIVE DOCUMENT, FISCAL YEAR 1983
Dec. 1981 56 p Supersedes AFWAL-TR-80-3144
(AF Proj. 9991)
(AD-A110585; AFWAL-TR-81-3142; AFWAL-TR-80-3144)
Avail: NTIS HC A04/MF A01 CSCL 05/1

The document presents an overview of the four Technical Planning Objectives (TPO) and supporting data for each. These are extracted from the technical plan of the Flight Dynamics Laboratory (FDL). Information is largely based on FDL fiscal 1983 technology plan omitting specific funding and timing information of an 'Official Use Only' nature. Technical objectives are described for the technical areas of Structures and Dynamics, Vehicle Equipment/Subsystems, Flight Control and Aeromechanics. Points of contact for more information in each of the areas are identified. GRA

N82-26198# Niels Bohr Inst., Copenhagen (Denmark).
MONTE-CARLO SUPPORT FOR THE FLUXON CONFINEMENT MECHANISM
J. Greensite and B. Lautrup Mar. 1981 13 p refs
(NBI-HE-81-4) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Monte Carlo evidence of a first order phase transition in 4 dimensional lattice SO(3) gauge theory is presented. This result stands in sharp contrast to the known single phase structure of the corresponding SU(2) theory. Since SU(2) and SO(3) differ only by a 2 sub 2 center, it is concluded that the 2 sub 2 degrees of freedom are essential in disordering the SU(2) system, probably via the fluxon condensation scheme suggested by 't Hooft. DOE

Typical Subject Index Listing



The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7050).

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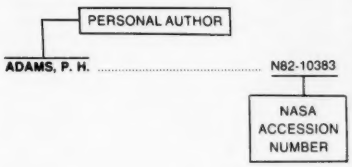

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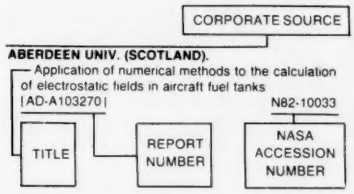

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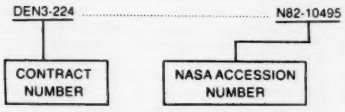

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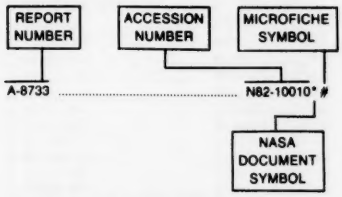

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CSU-ATS-335 ..... N82-25677* #

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